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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstracts Bulletin) is a monthly publication of the Management Support Division of the Office of Pesticides and Toxic Substances, Environmental Protection Agency

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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81-0301. Ladonin, V. F.; Chesalin, G. A.; Samoilov, L. N.; Spesivtsev, L. G.; Talova, V. I. (All-Union Res. Inst. Fert. & Agron., Moscow, USSR) **Premenenie ^{15}N dlya izucheniya deistviya gerbitsidov na kul'turnye i sornye rasteniya. II. Osobennosti deistviya gerbitsidov na azotistyi obmen ustoichivykh i chuvstvitel'nykh k nim rastenii. [Use of ^{15}N for analysis of the effect of herbicides on crops and weeds. II. Characteristic features of the effect of herbicides on nitrogen metabolism in sensitive and resistant plants.]** *Agrokhimiya* (9): 116-122; 1980 (11 references) (Russian).

The effect of the herbicides 2,4-D, dicamba, atrazine and lenacil on nitrogen metabolism of plants with different sensitivity to these herbicides was studied. The use of ^{15}N showed that herbicides caused marked short-term inhibition of protein biosynthesis in the leaves of pea, bean and corn, causing redistribution of nitrogen in leaves, stems and roots of sensitive plants.

81-0302. Kardell, L. (Swedish Univ. Agric. Sci., Uppsala, Sweden) **Forest berries and mushrooms – an endangered resource?** *Ambio* 9(5): 241-247; 1980 (15 references).

There is concern that modern forestry practices in Sweden may reduce the amounts of wild mushrooms and berries harvested. The types and quantities of berries and mushrooms collected by the public are discussed. Only 10% of the potential yield is actually harvested. The effects of herbicides on berries is incompletely documented, however it is concluded that the total area subjected to herbicide treatment and total effects are both minimal. Consumption of contaminated berries and mushrooms is concluded to be unlikely, due to posting of sprayed areas and the disagreeable taste and odor of contaminated berries.

81-0303. Spiker, R. (Author address not given) **The Stoltzenberg Syndrome: West Germany's biggest environmental scandal continues.** *Ambio* 9(5): 256-257; 1980.

An abandoned military chemical plant which caused the death of one child before its discovery by the general public and authorities is described. Among the improperly-stored chemicals discovered were phosgene gas, the nerve gas Tabun, tear gas, Yperite (mustard gas), sarin and soman. Many substances were found in leaking containers, and the soil beneath the plant and a large 2-3 m thick area around the plant are currently being removed. Some problems with placing responsibility for such a disaster are discussed.

81-0304. Glockling, F. (Chem. Dep., Queen Univ., Belfast BT9 5AG, Ireland) **Organometallic compounds in relation to pollution.** *Anal. Proc.* 17(10): 417-422; 1980 (7 references).

Four types of organometallic compounds are considered: organosilanes, organolead compounds, organomercurials, and organotin compounds. Organomercurials are used in industry and in agriculture. They are potent compounds with a broad spectrum of effectiveness as fungicides. All soluble mercury compounds are toxic. The monomethyl mercurials are extremely toxic in that they rapidly cause irreversible brain damage. The animal body only slowly excretes the chemicals through the degradation process of demethylation. Various trimethylsilylmethylmercury compounds have been examined and their chemical reactivity was found to be similar to that of the methylmercurials. However, their mammalian toxicity is much lower than that of the methylmercurials, even though they do not undergo extensive dealkylation in the animal body. Organotins are also used as fungicides but have a lower mammalian toxicity than the organomercurials.

81-0305. Seltmann, H. (North Carolina State Univ., Agric. Res., SEA, USDA, Raleigh, NC) **Effects attributed to maleic hydrazide when used for chemical sucker control on bright tobacco.** *Beitr. Tabakforsch.* 10(2): 120-126; 1980 (11 references).

Fifteen competitive plants of bright (Virginia) tobacco were planted and treated with 5 contact agents and a systemic sucker-controlling agent (maleic hydrazide). Chemical and physical analyses demonstrated that filling capacity at 13% moisture and equilibrium content measured at 60% relative humidity were significantly lower for treated plants. Treated plants also had lower total ash, alkalinity of water soluble ash, and nicotine levels. Maleic hydrazide treatment increased reducing sugar levels and equilibrium moisture content.

81-0306. Davies, O. L. (Dep. Stat., Univ. Coll. Wales, Aberystwyth, Wales) **Note on regression with correlated responses.** *Biometrics* 36(3): 551-552; 1980 (4 references).

A discussion is presented of the use of regression models with correlated responses. The example used is an accelerated storage test for the purpose of estimating the shelf life of drugs and chemicals, including herbicides and insecticides. Samples are stored in ovens at elevated temperatures, with the standard being kept at a temperature low enough to prevent deterioration. The potency of the sample is given by the ratio of the response of the chemical in a sample stored at the elevated temperatures to the response of the standard. The model chosen to represent the deterioration of the chemical at various temperatures has 2 independent variables (time and temperature) and 2-3 parameters. In such a case, the samples will usually be assayed in groups of 3 or 5 against the same set of standards, and will then be correlated. It is emphasized that this correlation should be taken into account in the fitting of a response model.

81-0307. Dobbs, A. J. (Author address not given) **Environmental effects of industrial chemicals.** *BRE News* 51: 10-11; 1980.

Three investigations into specific aspects of the use of wood preservatives are reviewed and information is presented on the current work on the environmental effects of new chemicals in general. Pentachlorophenol (PCP) is a biocide with non-agricultural as well as agricultural uses. PCP is currently a trace component of virtually all environmental samples. Organochlorine insecticides are also universally distributed in the environment. An important consideration in connection with PCP is the presence of polychlorodibenzo-*p*-dioxins in the commercial product. The concern over PCDD impurities has resulted from recent evidence on highly toxic 2,3,7,8-TCDD. Experiments have demonstrated that the more toxic members of over 75 different PCDDs are broken down in sunlight more rapidly than are the less toxic members.

81-0308. Falandysz, J. (Dep. Food Sci., Inst. Chem. & Anal., Acad. Med., Gdansk, Poland) **Polichlorowane trojfenyl w srodowisku. [Polychlorinated terphenyls in the environment.]** *Bromatol. Chem. Toksykol.* 12(3): 299-304; 1979 (61 references) (Polish).

PCT (Polychlorinated terphenyls) similar to PCB (polychlorinated biphenyls) appear as contaminants and foreign matter in food. Polychlorinated terphenyls accumulate in the lipids of organisms. The toxicity of PCT and mixtures with pesticides was the subject of earlier studies. It was proven that such mixtures extend the activity period of insecticides, and by itself PCT was toxic against *Galerucella xanthomeloena* Schr. The listed references describe the various effects of pure PCT compounds or mixtures on the various organs (liver, stomach) of various animals (rats, monkeys, fish, partridges). PCT is biocummulative in the tissues of various organisms. This was confirmed in sediments from the bottom of the Mediterranean Sea, industrial sewers in USA, fish from the Tama river in Japan, eels and oysters in Europe, tissues and eggs in some species of water birds, and in the blood and fat tissue of humans. PCT used as filler in coatings in silos not only contaminated the feed but also indirectly contaminated milk. The migration of PCT from various packing materials into food was also observed.

81-0309. Szymczak, J. (Dep. Food Sci., Acad. Med., Wroclaw, Poland) **Wplyw fungicydow stosowanych w upranie maku nq zawartosc i sklad oleju z nasion. [Effect of fungicides used in poppy cultures on the content and composition of seed oil.]** *Bromatol. Chem. Toksykol.* 12(4): 357-362; 1979 (4 references) (Polish).

A study of the effects of fungicides used in poppy plantings during two growing seasons on the oil content and its composition was the subject of this research. Chemical analysis of poppy seeds carried out 3 mo after harvest included the determination of humidity, the mass of 1000 seeds, the fat content and the composition of the fatty acids. Four fungicides were applied; ethylmercuric phosphate (Granosan) and tetramethylthiuram (thiram) for seed treatment, copper oxychloride (Miedzian 50) and zinc ethylene bis-dithiocarbamate (zineb) to spray the seedlings. The results were not identical in both growing seasons. The results indicate only small differences in the oil content and the composition of the fatty acids due to fungicide treatment. Therefore, it is concluded that fungicide application does not decrease the nutritional value of poppy seeds.

81-0310. Nabrzyski, M. (Dep. Food Sci., Inst. Chem. & Anal., Acad. Med., Gdansk, Poland) **Zanieczyszczenia zywnosci metalam: ciezkimi. [Contamination of food stuffs with heavy metals.]** *Bromatol. Chem. Toksykol.* 12(4): 411-420; 1979 (52 references) (Polish).

Heavy metals (mercury, cadmium and lead) can originate from two sources: natural contamination by the trophic chain of the biosphere, and contamination caused by human activities including agricultural use. Such contaminants accumulate in plants and animals. Mercury, cadmium and lead are generally harmful to the humans and, therefore, are undesirable in food. A literature review indicates that the daily intake of mercury is approximately the same in various countries, except Japan. There it is extremely high due to fish consumption and the high contamination of the environment with toxic metals. Mercury contents in milk and powdered milk differ slightly in various countries. The mercury content is much higher in fresh fish and canned fish (particularly tuna fish) than in meat. Shrimp contains less mercury than fish. In animals, the highest mercury content was located in the kidneys. Greater differences in daily cadmium intake were found in various countries (greatest in Japan and lowest in England). Tolerances of cadmium in food are the least regulated. The kidneys are critical organs in the accumulation of cadmium. In fruits and vegetables, lead content is generally higher than mercury and cadmium. The highest lead content was found in lettuce (16.1 μg) and in apples (28.8 g/100 g). The intake of lead varies in different countries. About 70% of lead is consumed in milk and milk products. Mercury, cadmium and lead are also found in honey.

81-0311. Rubin, B.; Leavitt, J. R. C.; Penner, D.; Saettler, A. W. (Pestic. Res. Cent., Dep. Crop & Soil Sci., Michigan State Univ., East Lansing, MI 48824) **Interaction of antioxidants with ozone and herbicide stress.** *Bull. Environ. Contam. Toxicol.* 25(4): 623-629; 1980 (10 references).

The interactions between antioxidants and ozone stress or herbicides in navy beans, corn and soybeans, either treated with antioxidants and fumigated with ozone, or treated with antioxidants and pesticides, were studied.

All three antioxidants decreased ozone injury. The herbicides oxidiazon, linuron, atrazine, endothall and bentazon, were each applied to corn in conjunction with four antioxidants. Benzoate and endothall in combination gave the highest yield of corn. On soybeans, propyl gallate alone increased yield. Piperyl butoxide and EDU increased soybean injury from endothall. The mechanism of action of antioxidants on microsomal MFO activity in plants is discussed.

81-0312. Garcia, R.; Federici, B. A.; Hall, I. M.; Mulla, M. S.; Schaefer, C. H. (Dep. Entomol., Univ. California, Berkeley, CA 94720) **BTI – a potent new biological weapon.** *Calif. Agric.* 34(3): 18-19; 1980.

The use of the spore-forming bacterium *Bacillus thuringiensis* var. *israelensis* (BTI) in mosquito control is discussed. This strain acts initially, and perhaps primarily, as a stomach poison. When fourth-stage larvae of *Aedes aegypti, Culex tarsalis,* and *Psorophora columbiae* were placed in water containing 0.1 ppm BTI they ceased feeding and became lethargic. The cells of the midgut epithelium were most affected. It is proposed that destruction of the gut may interfere with the ability to regulate the flow of toxic substances through the basement membrane into the body cavity, causing the blood to become toxic. It has been shown that for some *Culex* species, a moderate to high concentration will kill ~ 50% of a test population in 15 min, and the remainder of the population in about 1 hr. Successful field trials using BTI in irrigated pastures, storm drains, ponds, dairy lagoons, and salt marshes are described. Preliminary test have shown that BTI is a selective toxin.

81-0313. Gall, G. A. E.; Cech, J. J., Jr.; Garcia, R.; Resh, V. H.; Washino, R. K. (Dep. Anim. Sci., Univ. California, Davis, CA 95616) **Mosquito fish – an established predator.** *Calif. Agric.* 34(3): 21-22; 1980.

Some aspects of the use of the mosquito fish, *Gambusia affinis,* in mosquito control are discussed. This fish has been used in mosquito control programs since about 1905, and adapts to a wide range of water types, temperatures and oxygen levels. They feed on aquatic insects, terrestrial insects that have fallen into the water, and insect larvae, particularly for mosquito larvae when the density is high. Techniques for enhancing mosquito fish development in the field are discussed, and a long-term project for developing new technology for mass-rearing mosquito fish is described. Other areas being pursued are selection for longer, faster-growing fish that will eat more insect larvae, and for fish showing early sexual maturity and high fecundity.

81-0314. Asman, M.; McDonald, P. T.; Zalom, F. G. (Dep. Entomol., Univ. California, Berkeley, CA 94720) **Genetic manipulation of mosquitoes.** *Calif. Agric.* 34(3): 23-24; 1980.

Results are reported of some experiments designed to test the feasibility of using genetic manipulation to control insects. A double sex-linked heterogenous translocation that includes all 3 chromosomes in the 2 interchanges was studied. This linked combination is inherited only by males, which show only 28% fertility while competing well with males of field populations. One set of field tests showed that the release stock had become less competitive with time, thus the release did not have sufficient impact to cause a continuing population reduction in the field. However, compared with previous years, there was a 4-wk delay before the population reached a peak. Work has also been carried out on a genotype involving decreased competence of *Culex tarsalis* as a vector of encephalitis viruses. Studies have also been performed on the feasibility of using the sterile male technique, on the behavior and ecology of *C. tarsalis* in the field, and on the identification of genetic selection factors that reduce competitive fitness.

81-0315. Anderson, J. R.; Asman, M. (Dep. Entomol., Univ. California, Berkeley, CA 94720) **Using sterile males to reduce mosquito numbers.** *Calif. Agric.* 34(3): 24-25; 1980.

Results are reported on experiments on the use of sterile males to reduce populations of the treehole mosquito, *Aedes sierrensis.* Virgin females along with males sterilized in the laboratory by 7 kR of γ irradiation were released into large tents having screened sides and natural turf floors. All females collected and dissected were found to be inseminated. Mosquito eggs were examined microscopically for the presence of developing embryos, and it was found that egg fertility was reduced to 42% when 500 sterile males and 500 normal males were released with 500 virgin females. Release of 1000 normal males with 500 virgin females produced 3% sterile eggs, while release of 1000 sterile males with 500 virgin females produced 96% sterile eggs. Sterile males were found to compete equally with normal males in all experiments and survival rates were also equal.

81-0316. Federici, B. A.; Fetter-Lasko, J.; Soares, G.; Tsao, P. W. (Div. Biol. Control, Univ. California, Riverside, CA 92521) **Fungi show promise in biological control.** *Calif. Agric.* 34(3): 25-27; 1980.

Results are reported of preliminary experiments on the biology, cultivation and mosquito control potential of three fungi; *Tolypocladium cylindrosporum, Lagenidium giganteum* and *Coelomomyces dodgei.* In laboratory tests with the treehole mosquito, 100% mortality was achieved within 4 days when second stage larvae were exposed to 5×10^5 blastospores of *T. cylindrosporum*/ml of medium. Some of the advantages of using this fungus under field conditions are discussed. In rice field trials using *L.*

giganteum, Culex tarsalis larvae were eliminated within 5 days of treatment. One strain of this species shows a broad host range, including species of *Aedes, Anopheles, Culex, Culiseta* and *Psorophora.* At the same time, studies on non-target organisms from 29 taxa indicate that none is susceptible to infection. The fungus *C. dodgei* has been studied to a lesser extent because it has a complex life cycle and unique nutritional requirements. However, its use is being pursued because the biflagellate zygote actively seeks out mosquito larvae, and has been known to cause larval mortality in excess of 90%. It is pointed out that these technologies will be more expensive to develop and use than current technologies, but environmental costs will be lower since fungi are highly specific.

81-0317. Platzer, E. G. (Dep. Nematol., Univ. California, Riverside, CA 92521) **Nematodes as biological control agents.** *Calif. Agric.* 34(3): 27; 1980.

The use of *Romanomermis culicivorax*, a nematode parasite of mosquito larvae, as a biological control agent against mosquitoes, is discussed. Studies were designed to determine the effects of temperature, salinity and oxygen on the infective stage of *R. culicivorax.* The optimum temperature range for infectivity of *Culex pipiens* by pre-parasites was between 21 and 33°C. In other studies, it was shown that the low oxygen concentration in polluted water drastically reduced infectivity, and that at least half of the pre-parasites were able to infect mosquitoes at salt concentrations usually found in fresh waters. In mass-rearing studies, results were greatly improved by eliminating a contaminating fungus infection by an acid treatment of the cultures. In field tests, all species of mosquito larvae were injected, with the percentage of infection depending on the mosquito subfamily and test site. Some predators of *R. culicivorax* were also identified. It was concluded that this parasite has good potential for anopheline mosquito control under suitable conditions.

81-0318. Martin, G. C.; LaVine, P.; Sibbett, G. S.; Nishijima, C. (Dep. Pomol., Univ. California, Davis, CA) **Chemical pruning of walnut trees.** *Calif. Agric.* 34(10): 16-17; 1980.

Means of treating walnut trees chemically to encourage the production of more profitable crops are described. In particular the treatment of trees with dikegulac applied as a foliar spray produced increased numbers of lateral buds in the next spring. Concentrations of 1000-10,000 ppm were tested on Ashley variety trees. In the following year dikegulac was applied as a foliar spray at 500, 1000 or 2000 ppm in May, June, or July. May treatments of 500 or 1000 ppm induced more lateral bud growth than June or July treatments. The 2000 ppm level induced phytotoxicity. Vigorous limbs responded better to dikegulac treatment. Treatment in April or May resulted in the most desirable location of new shoots. Reduced terminal growth and increased development of lateral shoots produced a compact tree in comparison with the normal elongated growth.

81-0319. Elmer, H. S.; Brawner, O. L.; Ewart, W. H. (Div. Econ. Entomol., Dep. Entomol., Univ. California, Riverside, CA) **California red scale predator may create citricola control dilemma.** *Calif. Agric.* 34(11-12): 20-21; 1980.

The attempts to develop chemical applications for, and to introduce natural enemies to, both California red scale (CRS) and citricola scale are reviewed. A brief history of the two scale pests is given. Currently underway are attempts to introduce, colonize and permanently establish a number of natural predators and parasites of CRS. A mature navel orange block was isolated in 1974 to study the minimum effective levels of pesticides necessary for both CRS and citricola scale. Pesticides, used to control citrus thrips and citrus red mite, were not effective scalicides and thus, did not affect CRS or citricola populations. Parathion at 6 lbs (2.7 kg) AI or Supracide (methidathion) at 4 lbs (1.8 kg) AI/1500 gal water/acre (14,025 *l*/ha was applied once each year for CRS control. In plots untreated with pesticides, but in which natural predators were established, the percentage of oranges affected by CRS varied each year. In pesticide treated plots no citricola scale has been found since 1977. No effective parasite or predator has been found for CRS. If integrated management schemes are used, chemical applications, which are necessary, are likely to eliminate established CRS parasites.

81-0320. Sarhan, M. E.; Howitt, R. E.; Moore, C. V.; Mitchell, C. J. (Dep. Agric. Econ., Univ. Illinois, Urbana, IL) **Economic evaluation of mosquito control programs.** *Calif. Agric.* 34(11-12): 22-24; 1980.

The responsiveness of *Aedes nigromaculis* and *Culex tarsalis* populations to various mosquito control methods was evaluated. Control methods included spot spraying and wide-area spraying with larvicides, construction of ditches and levees, drainage of pond water, and encouragement of irrigation return flow systems. It was determined that pesticide treatments of small mosquito breeding sites were in general more significant than extensive spraying of large areas in reducing mosquito populations. Past use of pesticides increased the resistance of present populations to chemical spraying. It was found that time and effort put into reducing the source of breeding places for mosquitoes in a given district resulted in greater benefits derived from limited spraying due to lower resistance levels.

81-0321. Anonymous **Phenoxy-type weedicides damage susceptible varieties.** *Cane Grow. Q. Bull.* 44(2): 59; 1980.

Recommendations to sugarcane growers on the application rates of phenoxy herbicides to cane varieties Q80 and Q96 during the rapid growth period from mid-November to the beginning of autumn are outlined. Sprays applied below the cane canopy at this time will prevent damage that could otherwise be expected. However, aerial spraying can cause cause great damage to the crop. Application rates of MCPA and 2,4-D are generally much higher in aerial sprays and in shoulder or tractor mounted spray machines than in boom spray applications. After the rapid growth season, both methods of spraying can be safely used.

81-0322. Anonymous **Herbicides – conflicts of interests.** *Chem. Br.* 16(11): 575; 1980 (1 reference).

A commentary is presented on the conflict between agencies attempting to develop weed control techniques and farmers using their own application methods. In England, the Agriculture Research Council's Weed Research Organization (WRO) is charged with development of efficient pesticide application techniques. Competent users can often achieve greater cost effectiveness and lower environmental hazard by using doses and methods other than those specified by the manufacturer. However, some agencies feel that pesticides must be used exactly as specified. It is suggested that a formula must be found to reduce the conflict in order to avoid the introduction of new, restrictive legislation and/or the discreditation of the WRO.

81-0323. Moss, A. A. H. (Organics Div., ICI Ltd., Blackley, Manchester, England) **The chemist and the environment.** *Chem. Ind. (London)* (20): 807-811; 1980 (15 references).

A discussion of the role of the chemist in environmental studies is presented. Principal factors of industrial impact on the environment are listed; emissions to atmosphere, liquid aqueous effluent, disposal of other wastes, water supply and noise. Pollution is discussed, with emphasis on environmental problems, including toxicity to man, toxicity to terrestrial biota, toxicity to aquatic life, effects on ozone layer, land usage, and odors. The nature of these disturbances are tabulated and discussed. Major areas are hydrocarbons, asbestos, CO_2, CO, NO*x*, radioactive materials, SO*x*, and toxic metals. Sources, both natural and man-made, are presented. The complexity of the ecosystem is an important factor when attempting to determine the effects or potential effects of changes in the abundance of various pollutants. Examples of levels of pesticides, metal and industrial pollutants obtained by analytical chemists are given. Dieldrin, DDE, DDT, α-HCH (α-BHC), γ-HCH (lindane) and PCB levels determined in lobster, shrimp, mussels, cod and herring are presented. A detailed listing of industry-related analytical activities is given. The interactions of government and control authorities with chemists is also discussed.

81-0324. Palaniswamy, P. (Univ. New Brunswick, Fredericton, New Brunswick, Canada) **Perception of the female sex pheromone and male odors by the eastern spruce budworm, *Choristoneua fumiferana* (Clem) (Lepidoptera: Tortricidae). A behavioral and electrophysiological study.** *Diss. Abstr. Int. B* 41(5): 1642; 1980.

Studies were undertaken to determine the behavioral and electrophysiological responses of female spruce budworm moths to their own sex pheromone, to describe the precopulatory behavior of males, and to explore possible presence of male odors in this species. On exposure to the synthetic female sex pheromone of their own species the female spruce budworm moths responded behaviorally by moving away from the pheromone source, antennal grooming, flexing the body, and extruding the ovipositors. Electrophysiological studies employing an electro-antennogram (EAG) technique revealed that the antennal responses of female moths to the female sex pheromone increased with increasing concentration of the pheromone. The EAG responses were also found to change with the age of insects tested. Topical application of Altosid (methoprene), a juvenile hormone analogue (JHA), to the adult spruce budworm moths significantly reduced their EAG responses to the female sex pheromone, volatiles from adult males and larval frass. Newly emerged moths were more sensitive to JHA treatment than older moths. The age related response of female moths to their sex pheromone is discussed in terms of possible endogenous JH titers. (Author abstract by permission, abridged)

81-0325. Trumble, J. T. (Virginia Polytech. Inst. & State Univ., Blacksburg, VA) **Integrated control of *Carduus* thistles and ecological studies on *Rhinocyllus conicus* Froelich and *Ceuthorhynchidius horridus* (Panzer).** *Diss. Abstr. Int. B* 41(5): 1643; 1980.

A biological and integrated control program for *Carduus* thistles was developed using the biological control agents *Rhinocyllus conicus* Froelich and *Ceuthorhynchidius horridus* (Panzer) and the herbicide 2,4-D. Field studies on the development of *C. horridus* on *Carduus* thistles in Virginia showed that the weevil has one generation annually. Although adult feeding-marks, teneral adults and first and third instar larvae were easily found in the field, detection of eggs, second instars or overwintering adults was difficult and time consuming. Acute and chronic effects of spring applications of 2,4-D on adult *C. horridus* were examined. LC50 values for males and females corresponded to 41.7 and 36.6 times, respectively, the recommended application rate of 1.68 kg/ha. Herbicidal effect on larval *R. conicus* was studied by examining the mortality, emergence rates and weights of weevils developing from plants treated with 2,4-D. Acute and chronic effects of 2,4-D on adult *R. concicus* were also examined. LC50 values for adults prior to overwintering were lower than those for overwintered weevils, but were still at least 40 times the recommended application rate of 1.68

kg/ha. (Author abstract by permission, abridged. Copies of the thesis available from University Microfilms, order No. 8024019)

81-0326. Campbell, T. A. (Univ. Maryland, College Park, MD) **Differential responses of sweet corn (*Zea mays* L.) to butylate.** *Diss. Abstr. Int. B* 41(5): 1644; 1980.

Differential responses of sweet corn (*Zea mays* L.) to butylate were studied in greenhouse-pot experiments. Soil was a sandy-loam with a pH of 6.5 and organic matter content of 2.9%. Butylate was applied to the soil with a laboratory sprayer designed for herbicide application and immediately incorporated. Rates were varied by varying the concentration of butylate in the spray tank. Temperatures were 29°C during the day and 18°C at night in experiment 1 and a constant 32.2°C in subsequent experiments. Photoperiod was 18 hr for all experiments and was supplemented and extended with multivapor lamps. All responses were evaluated 2 wk after seeding. In experiment 1, the responses of 31 sweet corn cultivars of experimental strains to butylate were evaluated. Highly significant (1% level) differential responses were noted. In experiment 2, the responses of 2 strains to 3 concentrations of butylate were not different. In experiment 3, no differential responses were noted in 2 strains exposed to three concentrations of butylate. In experiment 4, the responses of 31 public inbreds to 11.2 kg/ha butylate were investigated. Significant (1% level) differential responses were noted. In experiment 5, the responses of inbreds were evaluated. Tolerance was found to be conditioned by one completely dominant gene. Variations in penetrance of the tolerant genotypes occurred and were probably due to the effects of abnormal butylate uptake, cytoplasmic-nuclear interactions, multiple alleles, and or modifying genes. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8025241)

81-0327. Pocchiari, F. (Ist. Super. Sanita, Rome, Italy) **Foreword to papers I-VI: accidental release of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) at Seveso, Italy.** *Ecotoxicol. Environ. Saf.* 4(3): 282; 1980.

An introduction is presented to six papers dealing with the accidental release of TCDD at Seveso, Italy on July 10, 1976. Background information regarding the incident is given. An uncontrollable exothermic reaction occurred in a trichlorophenol (TCP) production plant, and TCDD production increased beyond measure. Leaves, courtyard animals and birds were seriously affected in the area of the accident. Dermal lesions appeared among exposed persons. Some of the difficulties involved in determining the extent of exposure and in selecting protective strategies are discussed.

81-0328. di Domenico, A.; Silano, V.; Viviano, G.; Zapponi, G. (Lab. Ig. Lavoro, Ist. Super. Sanita, Rome, Italy) **Accidental release of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) at Seveso, Italy. I. Sensitivity and specificity of analytical procedures adopted for TCDD assay.** *Ecotoxicol. Environ. Saf.* 4(3): 283-297; 1980 (9 references).

A detailed discussed of the techniques used to assay TCDD following its accidental release at Seveso, Italy is presented. Parts per trillion levels of TCDD have been detected using low-resolution gas-liquid chromatography (GLC) in combination with multiple ion detection (MID)/mass spectrometry (MS). Levels of detection varied, however, depending on the sample type. Threshold detection levels were 0.2-10 ppt for soils, 2-50 ppt for vegetation, and 1-20 ng/m² for wipe-test cotton swabs. Excessive levels of PCB and DDT were found in some of the samples, but these were eliminated during clean-up.

81-0329. di Domenico, A.; Silano, V.; Viviano, G.; Zapponi, G. (Lab. Ig. Lavoro, Ist. Super. Sanita, Rome, Italy) **Accidental release of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) at Seveso, Italy. II. TCDD distribution in the soil surface layer.** *Ecotoxicol. Environ. Saf.* 4(3): 298-320; 1980 (8 references).

A discussion is presented concerning the distribution of TCDD in the soil surface layer from samples taken around Seveso, Italy, following the accidental release of TCDD. Samples were taken in open meadows or farming land by inserting a 7 cm steel cylinder to a depth of 7 cm during the first year and 15 cm during the second year after the incident. TCDD determination was by low resolution GLC in combination with MID/MS. Zones were established according to TCDD concentrations. The zone of highest concentration (A) contained levels from < 0.75 to 20×10^3 $\mu g/m^2$. The other zones (B and R) contained lower levels, < 50 and < 5 $\mu g/m^2$, respectively.

81-0330. di Domenico, A.; Silano, V.; Viviano, G.; Zapponi, G. (Lab. Ig. Lavoro, Ist. Super. Sanita, Rome, Italy) **Accidental release of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) at Seveso, Italy. III. Monitoring of residual TCDD levels in reclaimed buildings.** *Ecotoxicol. Environ. Saf.* 4(3): 321-326; 1980 (2 references).

Methods used to monitor TCDD levels in reclaimed buildings following the accidental release of TCDD in Seveso, Italy are described. Following evacuation of the area surrounding the plant, it was noted that the distribution of residues of TCDD was uneven, ranging from < 0.01 $\mu g/m^2$ to a few $\mu g/m^2$. To adequately evaluate the decontamination procedures, groups of buildings with similar TCDD levels were clustered. Three clusters were selected. After final decontamination, a minimum of 113 randomly selected samples were taken from each cluster and analyzed. All values were within the maximum permissible levels,

($\leq$ 0.75 $\mu g/m^2$ on exterior building surfaces and $\leq$ 0.01 $\mu g/m^2$ on interior building surfaces).

81-0331. di Domenico, A.; Silano, V.; Viviano, G.; Zapponi, G. (Lab. Ig. Lavoro, Ist. Sanita, Rome, Italy) **Accidental release of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) at Seveso, Italy. IV. Vertical distribution of TCDD in soil.** *Ecotoxicol. Environ. Saf.* 4(3): 327-338; 1980 (4 references).

Studies were performed to determine the vertical distribution of TCDD in soils in the vicinity of Seveso, Italy, following an accidental release of TCDD to the atmosphere. Samples were drawn from 27 sites in Zone A (closest to the point of release) in 1976, and in Zone A and B in 1977. Samples were taken from depths down to 30 cm and assayed for TCDD. The vertical distribution of TCDD varied greatly. In 1976, the highest concentrations were found on the surface, with a considerable decrease below 8 cm. In the 1977 study the highest levels were found at the 1.0-1.5 cm depth in Zone A, and at the 0.5 to 1.0 cm depth in Zone B. The results indicate that detoxification of soil could be achieved by removing the top 25 cm of soil (reducing the TCDD level by 90%) or thoroughly mixing the top 30 cm of soil (reducing the TCDD in the top 7 cm by 33-50%).

81-0332. di Domenico, A.; Silano, V.; Viviano, G.; Zapponi, G. (Lab. Ig. Lavoro, Ist. Super. Sanita, Rome, Italy) **Accidental release of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) at Seveso, Italy. V. Environmental persistence of TCDD in soil.** *Ecotoxicol. Environ. Saf.* 4(3): 339-345; 1980 (6 references).

Studies were performed to determine the persistence of TCDD in soil collected in the vicinity of Seveso, Italy, following an accidental TCDD release. Three surveys were conducted. August, 1976; September-December, 1976; and a dual sample, March, 1978, and December, 1977, through Jan. 5, 1978. TCDD decreased significantly between the first and second survey, but no decrease was noted between the second and third survey. The results indicate that the half-life of TCDD increases with its time in soil. One month after the accident, the mean TCDD half-life was 10-14 mo. However, 17 mo after the accident, the half-life was estimated to be > 10 yr.

81-0333. di Domenico, A.; Silano, V.; Viviano, G.; Zapponi, G. (Lab. Ig. Lavoro, Ist. Super. Sanita, Rome, Italy) **Accidental release of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) at Seveso, Italy. VI. TCDD levels in atmospheric particles.** *Ecotoxicol. Environ. Saf.* 4(3): 346-356; 1980 (7 references).

Studies on air samples were performed in the vicinity of Seveso, Italy, to determine the levels of TCDD following an accidental release of the compound into the atmosphere. Dustfall jars and high volume samplers were deployed at various distances from the release point. After collection with dustfall jars, dust and liquid phases were separated and analyzed separately. High volume samplers filtered out particles in the 0.3 to 100 μm ranged. Filters were extracted and the residues analyzed. Sporadic TCDD levels were observed throughout the study area. The concentrations of TCDD ranged from 0.06 to 2.1 ng/g dust from the dustfall jars. TCDD from the high volume samplers ranged from 0.17 to 0.5 ng/g dust. Exposure levels for people in various areas in the vicinity of Seveso were predicted.

81-0334. Allen, M. J. (Biophys. Lab., Dep. Physiol. & Environ. Stud., Sch. Agric., Univ. Nottingham, Loughborough LE12 5RD, England) **Cellular membranes.** *Experientia* 36(11): 1268-1273; 1980 (11 references).

Electrical characteristics of accessible surfaces were reviewed to elucidate membrane and cellular behavior under normal and chemically or physically stressed conditions. Absolute coulombic outputs of thylakoid membranes varied from day to day in a fractionally decreasing ratio. Using Bladex (cyanizine) or paraquat comparative results for a number of agents inhibiting or potentiating, respectively, electron flow were obtained. The electrochemical cells used to determine the coulombic output and relative activities of thylakoid membranes are described in detail. It is postulated that phytotoxic agents have distinct affects on epidermal cell membranes separate from those phytotoxic effects observed in the photosystem activities.

81-0335. Poiger, H.; Schlatter, C. (Inst. Toxicol., Fed. Inst. Technol., Zurich, Switzerland) **Influence of solvents and adsorbents on dermal and intestinal absorption of TCDD.** *Food Cosmet. Toxicol.* 18(5): 477-481; 1980 (12 references).

The liver concentration of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) was measured as a means of following the uptake of this chemical by the intestinal and dermal routes. Accumulation of the (radiolabeled) compound in the liver was found to provide a good and reproducible method of comparing TCDD uptake from different formulations. After oral administration of 14.7 ng TCDD using 50% ethanol as vehicle, 36.7% of the total dose was found in the liver after 24 hr. When the compound was administered in a mixture with soil particles, adsorption occurred and only about half of this amount was found in the liver. The liver level also decreased with increasing duration of contact between the soil and the dioxin. Adsorption onto activated carbon almost completely prevented uptake of the compound. Similar effects were observed after dermal application of TCDD in various formulations. The highest liver content, 14.8% of the dose,

was found after contact of the pure compound with the skin surface. The inhibiting effects of soil and activated carbon were even more pronounced. After incorporation of the dioxin into vaseline (a lipophilic ointment), 1.4% of the dose was found in the liver, whereas, after incorporation into polyethylene glycol 1500 (a hydrophilic ointment) containing 15% water, 14.1% was found in the liver. The potency of TCDD (applied in similar formations) to produce chloracne in the rabbit ear was tested. Threshold levels for the induction of lesions were between 1 μg for the pure compound and 160 μg when the compound was adsorbed onto charcoal. (Author abstract by permission)

81-0336. Chakrabarti, S.; Dastidar, S. G.; Das, K. K.; Banerjee, S. K. (Dep. Biochem., Univ. Coll. Sci., Calcutta 700019, India) **Malathion exposed seeds of *Vigna sinensis* (L.): changes at protein and nucleic acid levels.** *Indian J. Exp. Biol* 18(8): 896-898; 1980 (7 references).

The effects of residual malathion in *Vigna sinensis* seeds on their germination and biochemical deterioration was studied. The seeds were soaked in water overnight, then allowed to germinate for various periods of time (20-72 hr) in varying concentrations of malathion (20-400 ppm). RNA, DNA, and protein contents were determined in the germinating seeds. At low concentrations (up to 50 ppm), there was enhanced growth, and a proportionate increase in nucleic acid and protein contents. At the higher concentrations, there was a significant decrease in all these responses. It was noted that when malathion was withdrawn after 20 hr from a plate treated with 400 ppm malathion, inhibited values returned to normal after 72 hr. This suggests that the pesticide undergoes some metabolic changes to a product which is not inhibitory toward the parameters studied.

81-0337. Strik, J. J. T. W. A.; Janssen, M. M. T.; Colombi, A. M. (Dep. Toxicol., Agric. Univ., NL-6703 BC Wageningen, The Netherlands) **The incidence of porphyria in an Italian family.** *Int. J. Biochem.* 12(5-6): 879-881; 1980 (19 references).

An Italian family with some members residing in an area of TCDD contamination (near Seveso, Italy) and some members in an uncontaminated area (a few hundred km away) was studied for incidence of porphyria cutanea tarda (PCT). Two cases of PCT had been detected in individuals living in the TCDD area. Urinary porphyrin analysis was performed on 66 members of the family to detect a possible genetic or TCDD-evoked predisposition for PCT. In addition, thioethers and D-glucaric acid excretion was measured to detect any alternations in liver function or TCDD exposure. Results indicated 63% abnormal urinary porphyrin patterns in the group possibly exposed to TCDD, compared with 19% in the control. In the group exposed to TCDD possibly 25% had a total porphyrin between 200 and 400 μg/l, compared with 13% in the control group. Results of thioether determination were all normal, giving no indication of TCDD exposure. A family pedigree shows that 70% of those with high porphyrin excretion belong to the paternal side of the family. It is concluded that there is a genetic predisposition to PCT in this family, with the aggravating factor of alcohol or TCDD exposure giving rise to the two PCT cases.

81-0338. Strik, J. J. T. W. A.; de Wit, J. M. (Dep Toxicol., Agric. Univ., NL-6703 BC Wageningen, The Netherlands) **Health aspects of rabbits in a low-TCDD contaminated area.** *Int. J. Biochem.* 12(5/6): 999-1001; 1980 (12 references).

A study was performed to determine if exposure to low levels of TCDD has an effect on rabbits. Five pens of 20 rabbits each were set up on TCDD-contaminated soils, with levels ranging from 0.8 to 23.3 μg/m². At the end of 5 mo urine porphyrin was examined. The animals were sacrificed and histological examinations on kidneys and livers were performed. Total porphyrins in controls were 204 ± 55 μg/l, and ranged from 212 to 300 μg/l in experimental animals. Controls and experimental levels were not significantly different. Porphyrin patterns in the experimental groups were not significantly different from controls. No liver or kidney damage was detected. Creatinine values did not differ from controls, but the D-glucaric acid levels were higher in controls. These studies indicate that exposure to low levels of TCDD are not detrimental to rabbits.

81-0339. Newton, J. (Rentokil Ltd., Felcourt, West Sussex, England) **Alternatives to chlordecone for Pharoah's ant control.** *Int. Pest Control* 22(5): 112-135; 1980 (9 references).

Attempts to find a replacement for chlordecone to control *Monomorium pharaonis* are described. Prior to 1959 thallous sulfate was used. In 1959 it was replaced with dieldrin lacquer with considerable success, until the general safety of organochlorines was questioned. Between 1965 and 1968 propoxur lacquer was used, but was not suitable due to its fast knockdown, non-accumulation and repellent nature. Chlordecone (Kepone) was introduced in 1968. In 1975 the only manufacturer of chlordecone closed down due to gross malpractice leading to severe poisoning of 50 plant employees. Tests were made with iodofenphos, bendiocarb and boric acid. Methoprene, a juvenile hormone analogue, was found to possess a very low mammalian toxicity. However, this chemical took too long to remove all the queens from the colony. Preparations of boric acid were used for several years. At present, a number of possible alternatives to boric acid are being considered.

81-0340. Retnakaran, A. (For. Pest Manage. Inst., Canadian For. Serv., Sault Ste. Marie, Ontario P6A 5M7,

Canada) **Effect of 3 new moult-inhibiting growth regulators on the spruce budworm.** *J. Econ. Entomol.* 73(4): 520-524; 1980 (14 references).

Three new moult-inhibiting insect growth regulatory, BAY SIR 8514 {N-[[[4-trifluoromethoxy) phenyl]amino]carbonyl]- 2-chlorobenzamide}, LY-127603 {N-[[[5-(4-bromophenyl)-6-methylpyrazinyl]amino] carbonyl] 2-chlorbenzamide}, and LY-131215{2,6-dimethoxy-N-[5-[4-(pentafluorethoxy) phenyl] 1,3,4-thiadiazol-2-yl] benzamide} were tested in the laboratory and in the greenhouse against *Choristoneura fumiferana* (Clemens). In addition, BAY SIR 8514 was tested in the field. The EC50 ranged from 0.05 to 0.14 ppm in diet tests and the compounds were stable to autoclaving and UV-exposure from a sun lamp. Greenhouse tests indicated that the equivalent of 35 g in 4.7 l/ha gave 95% control for BAY SIR 8514, 98% for LY-127063 and 83% for LY-131215. Experimental aerial application of BAY SIR 8514 showed that at 210 g/ha or more, the level of control achieved was similar to that of the carbamate pesticide, aminocarb at 70 or 70 + 70 g/ha. (Author abstract by permission)

81-0341. Prokopy, R. J.; Coli, W. M.; Hislop, R. G.; Hauschild, K. I. (Dep. Entomol., Univ. Massachusetts, Amherst, MA 01003) **Integrated management of insect and mite pests in commercial apple orchards in Massachusetts.** *J. Econ. Entomol.* 73(4): 529-535; 1980 (44 references).

An integrated program of arthropod pest management was conducted in 8 commercial apple orchard blocks (ca. 4 ha each) in Massachusetts in 1978 and in 16 such blocks in 1979. The overall approach was use of visual traps, pheromone traps, and visual inspection of fruit and foliage in intensive weekly or semi-weekly sampling of pest and beneficial predator populations, use of economic threshold levels of principal pests, and advice to growers of need, optimal timing, and type of pesticide to be applied for pest control. Compared with check blocks (which were treated with pesticide according to a traditional preventative-type program), integrated pest management blocks (both years combined) evidenced only 60% as much fruit injury, received only 63% as many insecticide and 37% as many miticide treatments, had substantially greater numbers of beneficial predators of pest mites and aphids, and realized a net benefit of $278.18/ha (exclusive of scouting and program management costs). (Author abstract by permission)

81-0342. Onsager, J. A.; Henry, J. E.; Foster, R. N.; Staten, R. T. (Rangeland Insect Lab., Agric. Res., SEA, USDA, Bozeman, MT 59717) **Acceptance of wheat bran bait by species of rangeland grasshoppers.** *J. Econ. Entomol.* 73(4): 548-551; 1980 (8 references).

The experimental design is described for a 8500 ha pilot management test of wheat bran bait containing chemical insecticide, *Nosema locustae* Canning (an alternative to chemical insecticides), or both, for control of a complex of rangeland grasshoppers. One objective was to determine which species accepted the bait. Field plots were treated by aircraft with 0.56, 1.12, or 1.68 kg or 1.96% carbaryl-treated flaky wheat bran bait/ha. Acceptance of bait varied greatly within 28 observed species of grasshoppers. All major pest species except *Amphitornus coloradus* Thomas and *Camnula pellucida* (Scudder) were susceptible. In general, species of Acridinae and Gomphocerinea (slant-face grasshoppers) suffered slightly greater mortality than species of Melanoplinae (spur-throated grasshoppers), while Oedipodinae (banded-wing grasshoppers) were affected least. Such differences could be exploited in a management program based primarily on judicious use of selective bait. (Author abstract by permission)

81-0343. Hoying, S. A.; Riedl, H. (Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Susceptibility of the codling moth to diflubenzuron.** *J. Econ. Entomol.* 73(4): 556-560; 1980 (15 references).

In tests with adults, eggs, and first instars of *Laspeyresia pomenella* (L.), only the eggs appeared to be susceptible to diflubenzuron (insect hormone analog). Young eggs less than 250°H (degree hours, base 10°C) old were most susceptible, but susceptibility declined with age. Significant mortality occurred also in first instars which hatched from eggs treated during the first half of the incubation period. In contrast, direct exposure of first instars to surface residues did not affect survival or subsequent development to the adult stage. Combined egg and first instar mortality averaged 91% if exposure occurred prior to the midpoint of egg development. Dosage-mortality curves were determined for eggs less than 250°H old which yielded LC50 values of 0.207 mg/l for technical diflubenzuron and 0.437 mg/l for the 25WP. Diflubenzuron applied topically to adult moths caused no mortality, nor did it affect normal oviposition behavior or viability of the offspring. Under field conditions, residues on pear foliage remained active against codling moth eggs for at least 6 wk. (Author abstract by permission)

81-0344. Faragalla, A. A.; Berry, E. C.; Guthrie, W. D. (Dep. Entomol., Iowa State Univ., Ames, IA 50011) **Ovicidal activity of diflubenzuron on European corn borer egg masses.** *J. Econ. Entomol.* 73(4): 573-574; 1980 (11 references).

Diflubenzuron (insect hormone analog) caused high mortality of egg masses of *Ostrinia nubialis* (Huebner) when dipped in the chemical at 1,2 3, and 4 days after oviposition. Hatchability of egg masses dipped in diflubenzuron for only 1 to 2 sec was low (33.2 *vs.* 92.8% for controls). Hatchability of egg masses dipped in only 1.95 ppm diflubenzuron was low (28.1 *vs.* 93.6% for controls); only 6.9% of the eggs hatched when dipped in 500 ppm diflubenzuron. (Author abstract by permission)

81-0345. Spates, G. E.; Wright, J. E. (Vet. Toxicol. & Entomol. Res. Lab., Agric. Res., SEA, USDA., College Station, TX 77840) **Residues of diflubenzuron applied topically to adult stable flies.** *J. Econ. Entomol.* 73(4): 595-598; 1980 (8 references).

Twenty-four hr after diflubenzuron (insect hormone analog) was applied topically to adult *Stomoxys calcitrans* (L.), 11-25% of the dose was extracted from the chromatography paper that lined the insect holding cages. The amount of diflubenzuron recovered from adults decreased gradually. Although the amount of diflubenzuron in the eggs of treated females was insufficient for quantitation by high pressure liquid chromatography analysis, there was enough to reduce egg hatchability 97% for the first 15 days post-treatment. (Author abstract by permission)

81-0346. Townsend, D. I. (Dow Chem. Co., Michigan Div., Midland, MI 48640) **The use of dioxin isomer group ratios to identify sources and define background levels of dioxins in the environment.** *J. Environ. Sci. Health B* 15(5): 571-609; 1980 (1 reference).

A way to identify sources and background levels of dioxins is described. Samples are analyzed for the identity and relative abundance of each of the seventy-five isomers of dioxin. Thermochemical reactions in the environment were found to rearrange the isomer content to form specific ratios which are characteristic of the source. Oxidation reactions in the atmosphere then cause a shift in the ratios characteristic of the environment into which the dioxins were released. This observed shift can be easily modeled. The formation of the isomers in the environment was duplicated in the laboratory by incineration studies with octachlorodibenzo-*p*-dioxin.

81-0347. Axelson, O.; Tagesson, C. (Dep. Occup. Med., Univ. Linkoping, S-58185 Linkoping, Sweden) **The clofibrate problem: a different viewpoint.** *Lancet* 2(8203): 1081; 1980 (14 references).

In this letter to the editor an earlier article dealing with clofibrate as a primary preventive medication active against ischemic heart disease is discussed. Clofibrate closely resembles the chlorinated phenoxy acid herbicides mecoprop and MCPA. An increased mortality among the treated individuals was observed. It is suggested that the increased mortality may have been due to the noted tendency towards excess malignancies in the hemopoietic system, liver, gallbladder, intestine, stomach, lung, bronchus and larynx. This pattern is similar to that noted among workers exposed to phenoxy acids. It is suggested, since species differences have been observed in tests on phenoxy acids, that tests for clofibrate carcinogenicity be performed on animals other than rats.

81-0348. Hardell, L. (Dep. Oncol., Univ. Hosp., S-90185 Umea, Sweden) **The clofibrate problem: a different viewpoint.** *Lancet* 2(8203): 1081-1082; 1980.

In this letter to the editor an earlier report on the use of the phenoxy acid derivative clofibrate as preventive for ischemic heart disease is discussed. Excess deaths occurred in the trial due to various major diseases. The cancers which were noted appeared to emphasize differences in incidence for cancer of the lung, bronchus, and larynx as well as incidences more than would have been expected for the liver, gallbladder and intestine. Cases of malignant transformations due to phenoxy acid exposure are cited. These cases included exposure to the herbicides 2,4,5-T, 2,4-D and MCPA. It is noted that in a series of 130 male patients presenting with primary liver cancer during 1972-1977, 38 (*vs.* 23 expected) were men in agricultural and forestry occupations with likely exposure to phenoxy acids.

81-0349. Anonymous **Clouds of controversy.** *MD* 24(10): 35-37; 1980.

A discussion of the controversy of the toxic effects of Agent Orange (2,4,5-T + 2,4-D) is presented. The controversy centers on the 2,4,5-T contaminant TCDD. As much as 1.9 ppm TCDD were found in the 12 million gal (45.41 *l*) of this herbicide which were sprayed over Vietnam. The effects of TCDD exposure in other areas have been well documented; the most well known example resulted from an explosion in Seveso, Italy. TCDD in Agent Orange has been implicated as the causative factor in many disabilities of servicemen who were exposed to Agent Orange during the Vietnam war.

81-0350. DeCrosta, A. (Author address not given) **The two faces of pesticide exports.** *Org. Gard.* 27(10): 79-84, 86; 1980.

Information is presented on the sale to foreign countries of pesticides banned in the United States. It is pointed out that pesticides produced in the US solely for export may be sent overseas regardless of their regulatory status here. In 1976, 25% of the total pesticide exports were not registered in the US. The pesticides are often sold to third world countries where the users are not instructed on safety precautions or possible hazards. Specific instances in Central American, Africa, Asia and South American are described. In addition to the hazard to the foreign users is a hazard to the US consumer, since the US imports many agricultural products from these countries. Some attempts to regulate the system are described, but are judged to be inadequate. Among the efforts are a provision requiring purchasers to sign a statement acknowledging they have been sold an unapproved pesticide, and programs to increase the competence of agricultural users.

81-0351. Boschi, P. M.; Gozzo, F.; Longoni, A. (Cent. Ric. Antiparassitari, Montedison, Milan, Italy) **A novel series of *O,O*-diethyl *O*-(1,3-disubstituted- 1,2,4-triazol-5-yl) phosphorothioates. Part I. Synthesis and laboratory evaluation.** *Pestic. Sci.* 11(3): 305-313; 1980 (19 references).

A novel series of *O,O*-diethyl *O*-(1-R′-3-R′′-1,2,4-triazol-5-yl) phosphorothioates, in which R′ was an alkyl group and R′′ was a radical characterized by the presence of a conjugated multiple bond, generally of a vinyl nature, has been synthesized and tested in the search for new insecticides. Several of the compounds showed a broad spectrum of activity, covering important species of Orthoptera, Hemiptera, Lepidoptera, Coleoptera, Diptera and mites. At the same time they were characterized by a relatively low oral toxicity to rats. (Author abstract by permission)

81-0352. Gozzo, F.; Masoero, M.; Quadrelli, L.; Zagni, A. (Cent. Ric. Antiparassitari, Montedison, Milan, Italy) **A novel series of *O,O*-diethyl *O*-(1,3-disubstituted- 1,2,4-triazol-5- yl) phosphorothioates. Part II. Quantitative structure-activity relationships.** *Pestic. Sci.* 11(3): 314-323; 1980 (14 references).

The *in vivo* toxicity data of 33 *O,O*-diethyl *O*-(1-alkyl-3-R′′- 1,2,4-triazol-5- yl) phosphorothioates, reported in Part I of this series, were subjected to multiregression analyses for the following organisms: *Leptinotarsa decemlineata* (larvae), *Macrosiphum euphorbiae* (aphids), *Culex pipiens* (adults), *Spodoptera littoralis* (larvae) and the rat. The activities were found to depend mainly on the steric parameters of R′′, these being best expressed by the values L, B_1 and B_4 of the computer program STERIMOL. It was shown that there were different steric requirements for each species and these are discussed. The predictive values of the best equations were also estimated. (Author abstract by permission)

81-0353. Mellis, J. M.; Kirkwood, R. C. (Dep. Biol., Univ. Strathclyde, Glasgow G1 1XW, England) **The uptake, translocation and metabolism of epronaz in selected species.** *Pestic. Sci.* 11(3): 324-330; 1980 (16 references).

The absorption, translocation and metabolism of the selective pre- or early post-emergence herbicide epronaz (*N*-ethyl-*N*-propyl- 3-propylsulfonyl- 1,2,4-triazole-1- carboxamide) were investigated using selected crop and weed species. The pattern of tolerance to epronaz of both germinating seeds and 10-day-old plants grown in nutrient solution, was found to be soybean (*Glycine max* L.) > maize (*Zea mays* L.) > cotton (*Gossypium hirsutium* L.) > rice (*Oryza sativa* L.) > barnyard grass [*Echinochloa crus-galli* (L). Beauv.]. In all species, absorption and translocation of ^{14}C from a nutrient solution containing [^{14}C]epronaz (0.02 μCi/ml) increased with time. Autoradiographic and liquid scintillation analysis indicated the presence of radioactivity in the apical regions of all species after 4 hr. Interspecies variation in uptake and the resistance of cotton may be partly due to compartmentalization of ^{14}C in the lysigenous glands in stem and leaves. Analysis of extracts from plants treated with [^{14}C]epronaz indicated the presence of epronaz, its major degradation product [3-propylsulfonyl-1,2,4-triazole (BTS 28 768)] and certain unknown radio-labeled compounds. The major metabolite (Unknown I) was believed to be a conjugate of certain plant components with either epronaz or BTS 28 768. The rate of formation of Unknown I corresponded to the relative resistance and susceptibility to epronaz of soybean, rice and barnyardgrass. The level of the herbicide remained much higher in cotton than in the other species, possibly reflecting compartmentalization and inactivation of epronaz in the lysigenous glands. For maize, high levels of uptake, exudation and degradation in the nutrient solution were recorded. (Author abstract by permission)

81-0354. Williams, W. P.; Furtado, D.; Nutbeam, A. R. (Dep. Biophys. & Bioeng., Chelsea Coll., Univ. London, London SW7, England) **Comparison between state I/state II adaptation in a unicellular green alga and high energy state quenching in isolated intact spinach chloroplasts.** *Photobiochem. Photobiophys.* 1(2):91-102; 1980 (35 references).

Studies were conducted which compared state I/state II adaptation in *Chlorella* and the high energy state quenching in isolated intact spinach chloroplasts. In uncontaminated cells the fluorescence yield of state I (far red illumination) and state II (red light illumination) were similar. However when cells were poisoned with DCMU (diuron) the fluorescence differences increased. The response of spinach chloroplasts was somewhat different from the algal response. Red and far-red illuminated samples both show marked reductions in fluorescence yield associated with HES quenching. On addition of DCMU a two-phase increase in yield was observed, but the changes were different from those seen in the algae. It is concluded that state I/state II adaptation in algae and HES quenching in chloroplasts are two distinct phenomena.

81-0355. Penionzhek, S. A. (Polish Acad. Sci., Warsaw, Poland) **Memorial – nasekomomu. [Memorial to an insect pest.]** *Priroda (Sofia)* (7): 126-128; 1980 (Russian).

The history of dissemination and biological control of Opuntia (cactus) in Australia is reviewed. Trials of natural enemies of Opuntia showed high efficacy of the larvae of *Cactoblastis cactorium*. Introduction of larvae in 1926 resulted in dramatic control of Opuntia growth (the vast majority of the scrub was destroyed by 1930-1932). The success of this biological method of control of Opuntia warrented establishment of Cactoblastis Memorial Hall.

81-0356. Lesca, P. (Author address not given) **La dioxine et le cancer. [Dioxin and cancer.]** *Recherche* 114: 977-979; 1980 (7 references) (French).

The biological effects of dioxin, a byproduct of herbicide production, are discussed in connection with recent publicity about the Love Canal toxic waste dump. Dioxin was found to be a potent inducer of monooxygenases (aryl hydrocarbon hydroxylases, AHH), which in turn form toxic metabolites from pollutants, including benzo(a)pyrene. The monooxygenases transform procarcinogens into ultimate carcinogens. This was demonstrated in recent experiments with rats treated with dioxin before benzo(a)pyrene treatment. Compared with the animals treated with benzo(a)pyrene only, very large quantities of toxic metabolites of benzo(a)pyrene (ultimate carcinogens) and major DNA damage were seen in the livers of the dioxin-pretreated animals. The findings and data in the literature indicate that dioxin is a potent cocarcinogen. Some researchers believe that it also has a direct carcinogenic effect.

81-0357. Cherwonogrodzky, J. W. (Dep. Microbiol. & Parasitol., Univ. Toronto, Toronto, Ontario M5S 1A1, Canada) **Microbial agents as insecticides.** *Residue Rev.* 76: 73-96; 1980 (101 references).

This review describes several microbial agents as alternatives to chemical insecticides. Of low toxicity and high specificity, they have also other advantages. By being a natural part of the environment, their application to a field does not upset the ecological balances at work. Instead, they merely correct an already existing imbalance, returning the numbers of a pest species to a tolerable level. They also have the advantage in that they are living pesticides, in some cases protecting a field for years after application by infecting and spreading from an insect to its progeny. Of the microbial agents reviewed, certain viruses and bacteria have already proved successful. The nuclear polyhedrosis viruses (NPV) have been useful in controlling sawflies, butterflies and moths, while *Bacillus thuringiensis* and *B. popilliae* are commercially available for use against several pests. This does not mean that all microbial agents are equally beneficial. Fungi and protozoa, although also a natural part of the environment, are less specific and act slowly. As for rickettsiae, it seems unlikely that these will ever be used for controlling insects as this groups appears more pathogenic for vertebrates. Only by understanding the potentials and limitations of these agents, therefore, can one best decide if their use against a pest has merit. Such information is frequently lacking and further investigations should be strongly encouraged. (Author abstract by permission)

81-0358. Shu, S. S. (Author address not given) **Opening session of the US-ROC seminar on Environmental Problems Associated with Pesticide Usage in the Intensive Agriculture System, April 7-17, 1979, Taipei, Taiwan.** *Residue Rev.* 76: 97-98; 1980.

A joint US-Taiwan seminar on the problems associated with pesticide use was held in Taiwan in April, 1979. The areas discussed included monitoring of pesticide residues in food and the environment, pesticide degradation, the chemistry of pesticides and their residues, and pesticide effects on nontarget organisms. Papers presented by the United States delegates were submitted for publication in volume 76 of *Residue Reviews* and abstracts of these papers appear in the appropriate sections of this issue of *Pesticides Abstracts.*

81-0359. Georghiou, G. P. (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Insecticide resistance and prospects for its management.** *Residue Rev.* 76: 131-145; 1980 (39 references).

The incidence of resistance to pesticides has increased substantially in recent years, especially among arthropods of agricultural importance, while it has continued to present serious difficulties in the control of species of importance to public health. By the end of 1978 the number of species that have developed strains resistant to one or more pesticides had increased to 414. Furthermore, laboratory studies have demonstrated that resistance can also develop toward pesticides of novel mode of action such as juvenile hormone analogs (methoprene) and chitin synthesis inhibitors (diflubenzuron). Increased awareness of actual and potential obstacles that resistance presents in the formulation of effective pest management programs has generated renewed interest in research on the dynamics and suppression of resistance. Emphasis is placed on the elucidation of the role of specific biological, behavioral, genetic, ecological, and operational parameters that influence resistance, and the utilization of this information in the formulation of strategies for its avoidance or suppression. The paper discusses the influence of a number of these parameters, including the role of gene dominance, insecticide dosage, residue persistence, and pest population dispersal. Operational considerations for forestalling resistance, including the use of synergists and the application of insecticides in suitable combinations or rotations, are also discussed. (Author abstract by permission) [Presented at the joint US-Taiwan Seminar, 1979.]

81-0360. Gunther, F. A. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Interpreting pesticide residue data at the analytical level.** *Residue Rev.* 76: 155-171; 1980 (14 references).

Only a residue analyst can properly and incisively interpret their own data. Uniformity of field substrate and of application can be highly variable, but adequate sample replication will help define these parameters for the analyst. Factors such as processing efficiency, variability of cleanup techniques utilized, fortification recoveries, in-

strumental errors, total precision and reliability, and minimum reproducible detectability are adequately understood only by the analyst for each pesticide in each field substrate situation. The numbers the analyst produces must be rounded off to accommodate these factors. Furthermore, the identities of claimed analytes at the ppm level are based upon technicological circumstantial evidence, often precarious without elaborate verification by ancillary analytical techniques. Proper public health decisions based upon detailed pesticide residue data can be made only if the analyst is honest in reporting the data to these officials to accommodate all these uncertainties. These officials probably will not understand these analytical details and their significance; data should therefore be reported as, for example, probable parathion, 2.0 ± 0.3 ppm. Rarely can a second decimal have any significance in modern pesticide residue methodology with random field samples. (Author abstract by permission) [Presented at the joint US-Taiwan Seminar, 1979]

81-0361. Hylin, J. W. (Univ. Hawaii, Honolulu, HI 96822) **Pesticide residue analysis of water and sediments: potential problems and some philosophy.** *Residue Rev.* 76: 203-210; 1980 (10 references).

The factors which must be considered in examining water and sediment for pesticide residues start with a decision as to which components will be separated and examined independently. Since most pesticide residues are not particularly soluble in water, they are found bound to particles in natural waters. Whether the gross sample will be examined for residues or whether the particles will be separated and examined separately from water are decisions the analyst must make during the planning stages of the study. All the components of the analytical stream, including sample collection equipment, must be such as to not introduce interfering contaminants into the analysis. Interferences may be minimized by careful cleaning and use of ultrapure reagents, or by selection of specific determination steps insensitive to the impurities present. Analysis of sediments for residues is more difficult since sediments are even more heterogeneous than natural water, including spatial and temporal variability. Usually residues concentrate in sediments so the sensitivity of the analytical procedure for them is less important than in the analysis of water. Finally, the other components of the water sediment ecosystem should be included in the study so that the significance of detectable residues may be assessed. (Author abstract by permission) [Presented at the joint US-Taiwan Seminar, 1979]

81-0362. Olson, J. R.; Gasiewicz, T. A.; Neal, R. A. (Dep. Pharmacol. & Ther., Sch. Med., State Univ. New York, Buffalo, NY 14214) **Tissue distribution, excretion, and metabolism of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) in the golden Syrian hamster.** *Toxicol. Appl. Pharmacol.* 56(1): 78-85; 1980 (18 references).

The hamster has been reported to be the least sensitive mammalian species to the acute toxicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). The fate of a single dose of [^{3}H]- or [^{14}C]-TCDD (650 μg/kg, ip or po) was assessed in male hamsters for up to 35 days following treatment. The greatest content (% dose/g tissue) of radioactivity was found in the liver, adipose tissue, and adrenals. The radioactivity in liver and adipose tissue was identified as unmetabolized TCDD. The rate of ^{3}H or ^{14}C elimination in urine and feces suggested a first-order process. Similar half-life of elimination ($t_{1/2}$) values of 12.0 ± 2.0 and 10.8 ± 2.4 days (mean ± SD) were obtained with ip administered [^{3}H]- and [^{14}C]-TCDD, respectively. With both [^{3}H]- and [^{14}C]-TCDD ~ 35 and 50% of the radioactivity was eliminated in urine and feces, respectively. The $t_{1/2}$ for po administered [^{3}H]-TCDD was 15.0 ± 2.5 days. High-pressure liquid chromatography of the urine and bile of animals receiving [^{14}C]-TCDD revealed one major and several minor radioactive peaks, none of which corresponded to [^{14}C]-TCDD. The apparent absence of TCDD metabolites in extracts of liver or adipose tissue indicated that the biotransformed products of TCDD are readily excreted in urine and bile. The enhanced rate of metabolism and excretion of TCDD in hamsters relative to other species may in part contribute to, but not totally explain, its unusual resistance to TCDD toxicity. (Author abstract by permission)

81-0363. Johnston, P.; Hodge, V.; Slimak, K. (JRB Assoc. Inc., McLean, VA 22102) **Materials balance for chlorobenzenes. Level 1. Preliminary.** *US NTIS PB Rep.* PB80-173,651: 103 pp.; 1979 (40 references).

The purpose of the Level 1 materials balance for chlorobenzenes is to evaluate the sources of release of the various chlorinated benzenes to the environment. The major route of commercial production of chlorinated benzenes is the direct chlorination of benzene with chlorine. Chlorinated benzenes are indirectly produced through the metabolism of pesticides, their production by marsh grass and their production as a byproduct of organic chemical production processes. Chlorinated benzenes are used consumptively in the production of many organic chemicals. These include chloronitrobenzene, diphenyl oxide, DDT, 3,4-dichloroaniline, 2,5-dichlorophenol, pentachloronitrobenzene (PCNB; quintozene), rubber intermediates, dyes, pesticides, and aromatic fluorocarbons. In addition, chlorinated benzenes have many non-consumptive uses, including uses as solvent, pesticide, deodorizer, dielectric fluid, coolant, lubricant, heat transfer medium, or synthetic transformer oil. The major sources of release of chlorinated benzenes to the environment appear to be from their various non-consumptive uses. Releases from production and consumptive uses appear to be comparatively minor. (Author abstract by permission)

81-0364. Foley, M. E.; Wax, L. M. (Agric. Res., SEA, USDA, Univ. Illinois, Urbana, IL 61801) **Effects of starch xanthate and sludge polymer on the initial activity with delayed incorporation, residual activity, and crop safety of several herbicides.** *Weed Sci.* 28(6): 626-632; 1980 (19 references).

Field studies were conducted in 1977 and 1978 to compare the efficacy of the starch xanthate and activated-sludge polymer controlled-release herbicide formulations with the emulsifiable-concentrate formulations. As incorporation was delayed from immediately to never incorporated, starch xanthate and sludge polymer thiocarbamate herbicide formulations had activity equal to that of the emulsifiable concentrates at the initial and final rating dates. Trifluralin (α,α,α-trifluoro-2,6-dinitro-*N*,*N*-dipropyl-*p*-toluidine) starch xanthate in 1977 had increased activity over that of the emulsifiable concentrate as incorporation was delayed, as indicated by initial and final visual rating. Starch xanthate did not greatly increase the residual activity of alachlor [2-chloro-2',6'-diethyl-*N*-(methoxymethyl) acetamide], or several thiocarbamate herbicides. Starch xanthate formulations of EPTC (*S*-ethyl dipropylthiocarbamate) and vernolate (*S*-propyl dipropylthiocarbamate) provided significantly less protection to corn than did addition of the protectant R-29148. The sludge polymer formulation had no controlled-release properties. (Author abstract by permission)

81-0365. Hatzios, K. K.; Penner, D. (Dep. Crop. & Soil Sci., Pestic Res. Cent., Michigan State Univ., East Lansing, MI 48824) **Absorption, translocation, and metabolism of ^{14}C-buthidazole in alfalfa *(Medicago sativa)* and quackgrass *(Agropyon repens).*** *Weed Sci.* 28(6): 635-639; 1980 (9 references).

The patterns of buthidazole {3-[5-(1,1-dimethylethyl)1,3,4-thiadiazol-2yl 4-hydroxy-1-methyl-2-imidazolidinone} uptake, translocation, and metabolism, and their potential contribution to crop selectively, were studied in tolerant alfalfa *Medicago sativa* L. Vernal) and susceptible quackgrass *[Agropyron repens* (L.) Beauv.]. ^{14}C-Buthidazole was absorbed from a 5 μl droplet by leaves of both alfalfa and quackgrass plants, but did not move basipetally to the roots or nontreated leaves in 14 days. ^{14}C-Buthidazole was absorbed very rapidly from Hoagland's solution by the roots of both species and translocated apoplastically to the leaves. Absorption and translocation of buthidazole did not differ between species, indicating that these processes did not contribute to crop selectivity. The herbicide and five metabolites were present in alfalfa leaf extracts 6 days after treatment. One unidentified metabolite accounted for 40% of the detected radioactivity 6 days after root application. Unmetabolized ^{14}C-buthidazole accounted for 87% of the total radioactivity in quackgrass after 6 days. Metabolites having different chromatographic properties were recovered from the two species. Differential rate and type of metabolism appeared to contribute to buthidazole selectively between the species. (Author abstract by permission)

81-0366. Pritchard, M. K.; Warren, G. F.; Dilley, R. A. (Dep. Plant Sci., Univ. Manitoba, Winnipeg, Manitoba, Canada) **Site of action of oxyfluorfen.** *Weed Sci.* 28(6): 640-645; 1980 (29 references).

The effects of oxyfluorfen [2-chloro-1-(3-ethoxy-4-nitrophenoxy) 4-(trifluoromethyl)benzene] were studied on electron transport and phosphorylation in isolated spinach (*Spinacia oleracea* L.) chloroplasts and on the response of green bean (*Phaseolus vulgaris* L. Spartan Arrow) to applications of oxyfluorfen alone or in combination with other herbicides. Coupled non-cyclic electron transfer and phosphorylation through photosystems I and II (H_2O → methyl viologen) were inhibited about 30% and 55%, respectively, by 10^{-4} *M* oxyfluorfen. Photosystem II-linked phosphorylation with dimethylbenzoquinone (2,5-dimethyl-*p*- benzoquinone) as the electron acceptor (H_2O → DMQ) was completely inhibited by 10^{-4} *M* oxyfluorfen. Photosystem II electron transport with dimethylbenzoquinone as the electron acceptor was inhibited 60% by 10^{-4} *M* oxyfluorfen, whereas photosystem I electron transport with 2,6-dichlorophenol indophenol as electron donor ($DCIPH_2$ → MV) was not susceptible to oxyfluorfen inhibition. Photosystem I-linked phosphorylation and the accompanying electron transport supported by durohydroquinone electron donation (DQH_2 → MV) were inhibited about 50% by 10^{-4} *M* oxyfluorfen, whereas cyclic phosphorylation was not inhibited at that concentration. Increased conductivity of a solution that contained leaf discs taken from green beans treated with various combinations of foliar-applied herbicides was a measure of membrane damage caused by the herbicide and revealed that oxyfluorfen has a different site of action than do photosynthesis inhibitor and bipyridilium herbicides. Oxyfluorfen plus dinoseb injury to green beans was additive, but the two herbicides did not have the same site of action. Oxyfluorfen did not appear to inhibit electron transport in chloroplasts at herbicidal rates, nor was it dependent on electron transport for activation. (Author abstract by permission)

81-0367. Simkins, G. S.; Moshier, L. J.; Russ, O. G. (Dep. Agron., Kansas State Univ., Manhattan, KS 66506) **Influence of acetamide herbicide applications on efficacy of the protectant CGA-43089 in grain sorghum *(Sorghum bicolor).*** *Weed Sci.* 28(6): 646-649; 1980 (9 references).

The influence of acetamide herbicide applications on efficacy of CGA-43089 [α-(cyanomethoximino) -benzacetonitrile] in grain sorghum *(Sorghum bicolor* L. Moench) was studied under field conditions. Acetamide herbicides applied preplant and incorporated on a Haynie very fine sandy loam caused more grain sorghum injury in 1979 than in 1978. Reductions in plant population, plant height and yield, along with delay in maturity, were severe for acetochlor [2-chloro-*N*-(ethoxymethyl) -6'-ethyl-*O*-acetotoluidide], metolachlor [2-chloro-*N*-(2- ethyl-6-methylphenyl) -*N*-(2-methoxy- 1-methylethyl) acetamide], and alachlor [2-chloro-2',6'- diethyl-*N*-(methoxymethyl) acetanilide]; moderate for diethatyl [*N*-(chloroacetyl)

-*N*-(2,6-diethylphenyl)glycine], xylachlor [2-chloro-*N*-(2,3-dimethylphenyl)-*N*-(1-methylethyl)acetamide], and butam [2,2-dimethyl-*N*- (1-methylethyl) -*N*-(phenylmethyl) propanamide]; and did not occur for propachlor (2-chloro-*N*-isopropylacetanilide) treatments. Acetamide herbicides caused less grain sorghum injury on a Reading silt loam than on a Haynie very fine sandy loam in 1979. CGA-43089 applied as a seed treatment protected grain sorghum grown on soils treated with metolachlor, alachlor, diethatyl, or xylachlor. Metolachlor-triazine combinations at five locations in Kansas reduced yields at two locations. CGA-43089 provided protection from metolachlor injury at those two locations. (Author abstract by permission)

81-0368. Fletcher, R. A.; Hildebrand, P.; Akey, W. (Dep. Environ. Biol., Univ. Guelph, Guelph, Ontario N1G 2W1, Canada) **Effect of glyphosate on membrane permeability in red beet *(Beta vulgaris)* root tissue.** *Weed Sci.* 28(6): 671-673; 1980 (10 references).

When discs of red beet *(Beta vulgaris* L.) root were immersed in various concentrations of glyphosate [*N*-(phosphonomethyl) glycine] either in phosphate (pH 6.8) or citrate (pH 6.2) buffer, no efflux of betacyanin occurred even after 1 wk. This suggests that glyphosate had little or no effect on membrane permeability. When beet discs were immersed in distilled water containing glyphosate, the betacyanin efflux increased with time and concentration. Measurement of pH indicated that the solutions were strongly acidic at first, but tended to approach a pH of 6.0 over 8 hr, after which time betacyanin efflux slowed down or stopped. The tissue was able to buffer the solutions sufficiently to prevent further efflux. When tissue discs were immersed in a series of citrate buffers ranging from pH 3 to 6.2, efflux occurred at pH 3 and slightly at pH 6.2. Efflux was not altered significantly with the addition of glyphosate. (Author abstract by permission)

81-0369. Hill, B. D.; Todd, B. G.; Stobbe, E. H. (Res. Stn., Agric. Canada, Lethbridge, Alberta T1J 4B1, Canada) **Effect of 2,4-D on the hydrolysis of diclofop-methyl in wild oat *(Avena fatua).*** *Weed Sci.* 28(6): 725-729; 1980 (19 references).

The basis for 2.4-D [(2,4-dichlorophenoxy) acetic acid] antagonism of diclofop-methyl {methyl 2-[4-(2,4-dichlorophenoxy) phenoxy]propanoate} toxicity to wild oat *(Avena fauta* L.) was investigated by studying changes in the metabolism of diclofop-methyl *in vitro.* An esterase from wild oat, which hydrolyzes diclofop-methyl to the acid diclofop, was extracted, partially purified, and the reaction was characterized. The rate of hydrolysis of ^{14}C-diclofop-methyl was 0.14 ηmoles/2 hr at standard assay conditions of 0.25 mg lyophilized enzyme preparation (19.6% protein) in 0.1 ml phosphate buffer (0.1 *M*, pH 7.0), substrate 5 μM. The addition of 2,4-D to this reaction did not inhibit ^{14}C-diclofop formation. Higher levels of 2,4-D stimulated enzymic hydrolysis. ^{14}C-Diclofop-methyl was rapidly metabolized to ^{14}C-diclofop and polar ^{14}C-conjugates when vacuum-infiltrated into wild oat leaf segments. The addition of 2,4-D caused small increases in the rates of both ^{14}C-diclofop-methyl de-esterification and ^{14}C-diclofop conjugation. It is concluded that 2,4-D does not inhibit the *in vitro* de-esterification of diclofop-methyl. (Author abstract by permission)

81-0370. McKercher, R. B.; McGregor, W. R. (Dep. Soil Sci., Univ. Saskatchewan, Saskatoon, Saskatchewan S7N OWO, Canada) **Triallate phytotoxicity and nitrogen fertilization.** *Weed Sci.* 28(6): 740-744; 1980 (10 references).

Application of NH_4^+-bearing fertilizer in field and pot experiments increased triallate [*S*-(2,3,3-trichloroallyl) diisopropylthiocarbamate] activity on oats *(Avena sativa* Harmon). The effect was consistent in the growth chamber, but field results were more variable, depending on soil moisture and temperature conditions. Because the pot experiments showed that the major effect was in shoot-zone-treated soils, the increased triallate activity was attributed to a reduction in triallate adsorption to the soil colloids. However, a smaller effect was measured in root-zone-treated soil, thus a physiological effect is also possible. (Author abstract by permission)

81-0371. Giardina, M. C.; Giardi, M. T.; Filacchioni, G. (Lab. Radiobiochem. & Plant Ecophysiol., Natl. Res. Counc., Rome, Italy) **4-Amino-2-chloro- 1,3,5-triazine: a new metabolite of atrazine by a soil bacterium.** *Agric. Biol. Chem.* 44(9): 2067-2072; 1980 (28 references).

The degradation of herbicide atrazine (2-chloro-4-ethylamino- 6-isopropylamino- 1,3,5-triazine) by a soil bacterium is reported. The bacterium involved is a species of *Nocardia*, which utilizes the atrazine as the sole source of carbon and nitrogen. A new metabolite, 4-amino-2-chloro-1,3,5-triazine, of the degradation of atrazine in the presence of glucose has been identified. The results further substantiated that atrazine can be degraded by soil microorganisms and indicated that deamination can also occur, as well as dealkylation. 4-Amino-2-chloro- 1,3,5-triazine did not show phytotoxic activity to oat *(Avena sativa* L.), demonstrating that deamination insures detoxification. (Author abstract by permission)

81-0372. Chou, S. S.; Taniguchi, E.; Eto, M. (Dep. Agric. Chem., Kyushu Univ., Fukoaka 812, Japan) **Photodegradation of dialkyl 1,3-dithiolan-2-ylidenemalonates and some other pesticides on solid particles.** *Agric. Biol. Chem.* 44(9): 2169-2177; 1980 (13 references).

On irradiation with UV light the fungicide isoprothiolane (diisepropyl 1-3-dithiolan- 2-ylidenemalonate) decomposed rapidly on the silica gel surface. The degradation pathways involved dithiolane ring cleavage, ester hydrolysis, decarboxylation, heterocycles formation such as dithietane and trithiolane, and sulfur liberation. The photoproducts confirmed were oxalic acid, dithiolanylidenemalonic acid, dithiolanylideneacetic acid, 2,4-bis[bis(isopropoxy- carbonyl)methylene]- 1,2,4-trithiolane and sulfur. The methyl and ethyl homologs of isoprothiolane similarly gave the corresponding photoproducts. The surface area where isoprotholane was placed appeared to be related closely with the photolysis rate. Isoprothiolane decomposed much more rapidly on sand than on a glass plate. This surface effect was greatly depressed under nitrogen atmosphere. Similar phenomena were observed with some other pesticides, with particularly those containing sulfur atoms in the molecule. (Author abstract by permission)

81-0373. Bondarev, V. S.; Spiridonov, Yu. Ya.; Shestakov, V. G.; Shabanov, A. K. (All-Union Res. Inst. Phytopathol., Moscow, USSR) **Nekotorye kineticheskie i termodinamicheskie kharakteristiki protsessa razlozheniya piklorama v pochve. [Some kinetic and thermodynamic characteristics of picloram degradation in soil.]** *Agrokhimiya* (9): 123-129; 1980 (14 references) (Russian).

Certain kinetic and thermodynamic characteristics of the process of degradation of the herbicide picloram (4-amino-3,5,6-trichloropicolinic acid) in soddy-podzolic soil are determined. Degradation of picloram at 1-8 mg/kg can be described satisfactorily by a first order equation. Thermodynamic parameters of this process indicate the biological nature of picloram degradation, such as the role of soil microorganisms in assimilation of picloram metabolites.

81-0374. Harper, D. B. (Dep. Agric. & Food Chem., Queen Univ., Belfast, Ireland) **Organochlorine pesticide pollution in Northern Ireland.** *Anal. Proc.* 17(10): 414-417; 1980 (6 references).

Organochlorine residues have been monitored in Northern Ireland in animal products and in the environment since 1972. DDT and dieldrin concentrations in meat have declined to levels which are barely detectable. Residues of HCH (BHC) have remained constant in swine and have risen in cattle 7-fold since 1972. HCH residues are mainly in the form of the α-isomer. Seasonal fluctuations of pesticide concentrations in butter were noted; little constant change was noted. Factors that might be responsible for the HCH concentrations are discussed. In river water samples, only α- and γ-isomers (α-BHC and lindane) of HCH were detected. HCH concentrations demonstrated a high correlation with urban population density in the catchment area of the river. It is suggested that a possible source of HCH in domestic sewage effluent is the use of HCH wood preservatives. Fabrics used in the home would adsorb HCH from the atmosphere and on washing would release the compound to the wash water. It was concluded that the majority of the organochlorine pollution in surface waters arises from domestic rather than agricultural or industrial use of HCH.

81-0375. Calvet, R.; Terce, M.; Arvieu, J. C. (Stn. Sci. Sol, Cent. Natl. Rech. Agron., INRA, F-78000 Versailles, France) **Mise au point bibliographique. Adsorption des pesticides par les sols et leurs constituants. II. Les facteurs de l'adsorption. [Bibliographic review. Adsorption of pesticides by soils and their constituents. II. The factors of the adsorption.]** *Ann. Agron.* 31(2): 125-162; 1980 (111 references) (French).

Effects of the following factors on adsorption of pesticides by soils was studied: molecular properties, adsorbent properties, temperature, and characteristics of the liquid phase. The effect of temperature on adsorption is dependent on the nature of the pesticide molecular structure and the structure of the adsorbents. The acidity of the solution determines the ionization of the molecules and this is significant in the adsorption of the chemical. Dissolved salts may also influence pesticide adsorption. Water content of the system is significant in that it controls the accessibility of surfaces and partly determines the physical-chemical properties of the adsorbents. Among the mineral constituents of soils which act as adsorbents are clays, oxides and hydroxides.

81-0376. Calvet, R.; Terce, M.; Arvieu, J. C. (Stn. Sci. Sol, Cent. Natl. Rech. Agron., INRA, F-78000 Versailles, France) **Mise au point bibliographique. Adsorption des pesticides par les sols et leurs constituants. III. Caracteristiques generales de l'adsorption des pesticides. [Bibliographic review. Adsorption of pesticides by soils and their constituents. III. General characteristics of the pesticides adsorption.]** *Ann. Agron.* 31(3): 239-257; 1980 (44 references) (French).

A Freundlich type relation can be used to describe the adsorption and desorption of pesticides by soils and their constituents. In desorption studies, hysteresis is frequently observed. Various categories of pesticide molecules can be classified according to their ability to be adsorbed. In general anionic molecules are less adsorbed than cationic molecules. Adsorption characteristics are closely correlated to the organic content of the soil rather than to the clay content. However, in soils where the organic content is less than 0.04 this relation is not clearly defined.

81-0377. Camoni, I.; Delle Femine, P.; Funari, E. (Lab. Tossicol., Ist. Super. Sanita, Rome, Italy) **Determinazione di bromo totale in cereali importati ed in altri prodotti pronti per il consumo. [Determination of total bromine content in imported cereals and other foods ready for consumption.]** *Ann. Ist. Super. Sanita* 15(4): 737-744; 1979 (24 references) (Italian).

One hundred forty five samples of cereals imported into Italy from different countries and 50 samples of imported dried fruits, rice, coffee, beans and other foodstuffs were analyzed by fluorescence spectrometry for undecomposed residues of bromine-based fumigants used either directly on crops or as soil disinfectants. None of the samples tested exceeded the maximum permisible level mandated by the Codex Alimentarius. The highest values were found in one sample of figs (20 mg/kg) and several samples of corn (up to 26 mg/kg).

81-0378. Albert, L.; Mendez, F.; Cebrian, M. E.; Portales, A. (Dep. Pharmacol. & Toxicol., CIEA-IPN, Mexico 14, D.F., Mexico) **Organochlorine pesticide residues in human adipose tissue in Mexico: results of a preliminary study in three Mexican cities.** *Arch. Environ. Health* 35(5): 262-269; 1980 (32 references).

The results of a preliminary search to determine the levels of organochlorine pesticide residues in the adipose tissue of the inhabitants of three Mexican cities of different socioeconomic characteristics are described herein. The concentrations and percent occurrence of nine compounds found are reported. In general, the samples analyzed had a large number of different organochlorine residues per sample. The results indicate that the inhabitants have been heavily exposed to 1,1,1-trichloro-2,2-*bis*-(*p*-chlorophenyl) ethane (DDT) and, to a lesser degree, to 1,2,3,4,5,6-hexachlorocyclohexane (BHC). The mean concentration of 1,1-dichloro-2,2- *bis*-(*p*-chlorophenyl) ethylene (DDE) in one of the groups (18.36 ppm, lipid basis) was one of the highest reported in the literature. It is also noteworthy that DDT was found in only 63, 89 and 55% of the samples from the three cities. (Author abstract by permission)

81-0379. Tso, T. C.; Chaplin, J. F.; LeLacheur, K. E.; Sheets, T. J. (Tab. Lab., Plant Genet. & Germplasm Inst., Beltsville Agric. Res. Cent., Agric. Res., USDA, Beltsville, MD 20705) **Pesticide-treated *vs.* pesticide-free tobacco. 1. Tobacco production and leaf analysis.** *Beitr. Tabakforsch.* 10(2): 114-119; 1980 (4 references).

Plots of pesticide-treated and pesticide-free tobacco were grown in fine sandy loam. Analyses of leaf components were conducted at different times. Pesticide-treated samples had a higher sand, ash, and malic and citric acid content than untreated samples. Untreated samples had higher total and reducing sugars and starch and cellulose contents than treated samples. Total nitrogenous fractions did not differ significantly between the 2 crops. Nicotine levels were almost identical. Levels of 28 organochlorine and organophosphorus insecticides were determined. In treated tobacco considerable amounts of DDT isomers and maleic hydrazide were found. Other pesticides were present only in trace amounts or remained undetectable.

81-0380. Leidy, R. B.; Sheets, T. J. (Pestic. Residue Res. Lab., North Carolina State Univ., Raleigh, NC) **Residues of ethoprop and disulfoton in soils and flue-cured tobacco.** *Beitr. Tabakforsch.* 10(2): 127-133; 1980 (5 references).

Residue levels of ethoprop and disulfoton in flue-cured tobacco grown in soil treated with both chemicals were determined. Ethoprop was applied April 6 at Clayton, NC, and May 7 at Reidsville, NC, at rates of 6.72 and 13.4 kg AI/ha. A combination treatment of 6.72 kg AI/ha of ethoprop plus 3.36 kg AI/ha disulfoton was included. Disulfoton was applied broadcast on the same dates at 3.4 and 6.7 kg AI/ha and then incorporated with the disk set to cut 12-15 cm deep. Soil samples were taken about 3 wk after transplanting and monthly thereafter. Tobacco was harvested 4 times at Clayton and 5 at Reidsville. Soil samples taken 21 days after applications contained 0.54 and 1.13 kg AI/ha. Total residues of disulfoton averaged 0.28 and 0.54 ppm at 3.4 and 6.7 kg/ha application rates. Residue levels of ethoprop in the first harvest from Clayton were 0.04, 0.02 and 0.08 ppm. Residues declined in subsequent harvests. Total residues of disulfoton plus 3 metabolites in the first samples were 2.52 and 1.89 ppm from Clayton and 10.24 and 6.50 ppm from Reidsville. These residues also declined in subsequent harvests.

81-0381. Ceschini, P.; Chauchaix, R. (Res. Div., Tabacofina S.A., Geneva, Switzerland) **Transfer of organochlorine pesticide residues into cigarette smoke as a function of tobacco blends and filter types.** *Beitr. Tabakforsch.* 10(2): 134-138; 1980 (11 references).

Determinations were made of the transfer of pesticides into the smoke from 4 different tobacco blends. Effects of filters on the transfer of pesticides into smoke were also evaluated. The pesticides studied include α-BHC, lindane, aldrin, DDT isomers, DDE isomers, TDE isomers, dieldrin, endrin, endosulfan and endosulfan sulfate. The average total pesticide transfer rate was 17%, and appeared to be independent of tobacco type (American blend, Maryland, Virginia or Oriental). However, the amount of retention by the cigarette filters depended on the efficiency of the filters, which was related to filter type. Retention by the cellulose acetate filter II was comparable to that of the cellulose filter, which demonstrated comparable retentions for both total pesticides and nicotine. In both low and high pressure drop cellulose acetate filters the pesticide retention was lower than the nicotine retention. When cigarettes that had been spiked with additional pesticides were tested, the activated charcoal did not retain pesticides from the smoke stream. *o,p'*-DDE was not present in the original tobacco, but it was detected in the smoke. Analysis of the butt of the cigarette left after smoking showed that fewer pesticides remained in the tobacco part after smoking than had been present before smoking.

81-0382. Anonymous **Pesticide residues and food.** *Br. Food J.* 82(898): 140-143; 1980 (E/m references).

The present systems for control of pesticide residues in food products in the United Kingdom and in West Germany are compared to determine whether the United Kingdom should adopt controls similar to those employed in West Germany. Each country has a registration and licensing system for pesticides before they are marketed. In neither system is the actual use of pesticides controlled. The essential difference in the two systems is the established Maximum Residue Limits guideline in West Germany; none exists in the United Kingdom. There was no evidence that the West Germany system provides better protection than the one used in the United Kingdom. However, the European Economic Council has adopted a directive establishing maximum pesticide residue levels in fruits and vegetables; similar directives for animal products and unprocessed cereals are expected.

81-0383. Szajkowski, Z.; Gertig, H. (Dep. Sci., Nutr. Cent., Inst. Biol. Pharm., PL-61878 Poznan, Poland) **Wplyw termicznego utrwalania i warunkow prxechowywania na zawartosc dinokapu w kompotach z owocow agrestu i porzeczki czerwonej. [The effect of thermal preservation and storing conditions on the dinocap content in gooseberry and red current compote.]** *Bromatol. Chem. Toksykol.* 12(3): 279-283; 1979 (4 references) (Polish).

Karathane 25 (AI 25% dinocap) is used on vegetables and fruits. The proposed residue tolerance is 1 mg/kg. The dynamics of the disappearance of dinocap versus time at different storage temperatures, and the effects of thermal preservation (boiling) of gooseberry and red currant compotes on the decrease of dinocap, were studied. Compotes were boiled for 15 min to seal the jars and than stored at temperatures of 4°C and 20°C. The results showed a considerable decrease in dinocap residues level after boiling the compote, which was caused by the hydrolysis of dinocap in the water environment at elevated temperatures. The temperature of storage of the preserves did not affect the level of dinocap residues in them. The duration of storage, however, did have a statistically significant effect on the decrease of dinocap residues in the product.

81-0384. Bulinski, R.; Kot, A. (Dep. Food Sci., Inst. Anal. & Technol. Pharm., Acad. Med., PL-20081 Lublin, Poland) **Zawartosc rteci calkowitej v tkankach bazantow i kuropatw. [Total mercury content in pheasant and partridge tissues.]** *Bromatol. Chem. Toksykol.* 12(3): 305-306; 1979 (8 references) (Polish).

Studies of mass poisonings of field and water birds indicated high levels of mercury content in bird tissues. The source of the mercury was determined to be seed grains treated with mercury compounds. Mercury accumulates in bird organisms. Pheasants and patridges were randomly selected from different regions in Poland. Tissues of thigh muscle, liver, kidney and quills were analyzed. The mercury content ranged from 0.0064 mg/kg in muscle to 0.156 mg/kg in liver. The mercury content was highest in quills, and decreased consecutively for kidney, liver, and muscle.

81-0385. Wedzisz, A.; Szwejda, J.; Sylwestrazak, J. (Dep. Food Sci., Inst. Environ. Res. & Bioanal., Acad. Med., Lodz, Poland) **Badanie dynamiki zanikania diazinonu (Basudinu 25 EC) na czesciach jadalnych roslin warzywnych. [Studies on the disintegration dynamics of diazinon (Basudin 25 EC) residue on edible parts of vegetables.]** *Bromatol. Chem. Toksykol.* 12(4): 333-344; 1979 (6 references) (Polish).

The pesticide diazinon was applied in quantities of 300 g/ha on experimental pea, wax bean, carrot, brussel sprout, cabbage and red beet fields. The degradation dynamics of diazinon residues in edible parts of the vegetables were studied during 3 growing seasons under local climatic and agrotechnical conditions. Determination of diazinon residues was done by thin-layer chromatography with semi-quantitative enzymatic detection. The results are presented in straight-line graphs. Decomposition of the diazinon to a concentration of 0.3 mg/kg was obtained in 10 days for carrots, 9 days for red beets, 8 days for cabbage and brussel sprouts, and 7 days

for peas and beans. This indicates that the pre-harvest waiting period could be shortened.

81-0386. Miyazaki, T.; Akiyama, K.; Kaneko, S.; Horii, S.; Yamagishi, T. (Tokyo Metrop. Res. Lab. Public Health, Hyakunincho, Shinjuku-ku, Tokyo 160, Japan) **Chlordane residues in human milk.** *Bull. Environ. Contam. Toxicol.* 25(4): 518-523; 1980 (18 references).

The problem of chlordane residues in human milk in Tokyo was studied. Samples of milk were extracted with petroleum ether-ethyl ether and cleaned up through acetonitrile-hexane, then eluted with hexane in a florisil column. Quantification of chlordane was carried out by gas chromatography. All milk samples contained oxychlordane and trans-nonachlor levels ranging from 0.1 to 1.1 ppb.

81-0387. Murray, H. E.; Neff, G. S.; Hrung, Y.; Giam, C. S. (Dep. Chem., Texas A&M Univ., College Station, TX 77843) **Determination of benzo(a)pyrene, hexachlorobenzene and pentachlorophenol in oysters from Galveston Bay, Texas.** *Bull. Environ. Contam. Toxicol.* 25(4): 663-667; 1980 (18 references).

Oysters from Galveston Bay, Texas, were surveyed for organic pollutant content. Oysters were collected in May near Morgan's Point and were transported in dry ice to the laboratory. Tissues were extracted and analyzed by gas chromatography with a nickel detector for hexachlorobenzene (HCB) and pentachlorophenol (PCP). Liquid chromatography in conjuction with a spectrophotometer was used for benzo(a)pyrene (BaP). The residue levels of HCB ranged from 0.31 to 1.37 ng/g; mean concentration was 0.63 ± 0.39 ppb. PCP levels ranged from 3.4 to 8.3 ng/g; mean concentration was 5.3 ± 1.9 ppb. These concentrations, when compared to the levels reported by other researchers, indicate a low active HCB input and a high active PCP input into Galveston Bay.

81-0388. Bastide, J.; Coste, C. M.; Meallier, P. (Groupe Etud. & Rech. Appl. Pluridisciplinaires, Univ. Perpignan, F-66025 Perpignan, France) **Hydrolyse chimique et activite pesticide. [Chemical hydrolysis and pesticidal activity.]** *Bull. Soc. Chim. Fr.* II(7-8): 405-415; 1980 (90 references) (French).

The effect of chemical and environmental hydrolytic degradation of pesticides in water and soil on their pesticidal activity is exemplified by benzamides, carbamates, organophosphorus and urea-based compounds. Temperature, pH, pesticide concentration, presence of colloids, organic material, mineral elements and complexes were identified as factors affecting hydrolysis. While theoretically the separation of chemical from microbiological hydrolysis in a biological environment can be achieved by sterilization, in practice the suppression of biological activity changes the physicochemical characteristics of the medium (enzyme destruction) and thus fails to simulate reality. Another approach would be to compare the effect of a structural change of a compound on decomposition velocity in the soil; parallel change of velocities would be non-indicative but differences in velocities would indicate stronger biological decomposition due to the substrate. With organophosphorus compounds and carbamates biological activity is directly correlated with decomposition velocity as a result of anticholinesterasic activity. Overall, chemical hydrolysis plays a role in pesticide deactivation in nature. Comparison of theoretical hydrolysis with actual decomposition in nature is a measure of the magnitude of the ecological impact on pesticide deactivation.

81-0389. Kulka, M. (Res. Lab., Uniroyal Ltd., Guelph, Ontario N1H 6N3, Canada) **Base-catalysed ring opening of *N*-(aminothioxomethyl) -5,6-dihydro-2-methyl- 1,4-oxathiin- 3-carboxamides.** *Can. J. Chem.* 58(19): 2044-2048; 1980 (5 references).

Ring opening reactions of 3-carbonyl substituted-5,6-dihydro-1,4-oxathiines were investigated to identify the products of rearrangement of these compounds. Vitatvax (carboxin) and Plantvax (oxycarboxin) fungicides belong to this group of oxathiines. Through base-catalyzed nucleophilic attack on carbon-2 of the compounds several condensation/rearrangement products are formed. Laboratory investigation on these compounds to further clarify these pathways and their possible end-products are described in detail.

81-0390. Parlar, H.; Baumann, R.; Korte, F. (Inst. Oekol. Chem., Ges. Strahlen, D-8050 Freising, BRD) **(2 + 2)-Photocycloadditionen der Cyclodieninsektizide als Festkoerper. [(2 + 2)-Photocycloadditions of solid cyclodiene insecticides.]** *Chemosphere* 9(9): 547-550; 1980 (8 references) (German).

UV irradiation ($\lambda > 290$ nm) of solid cyclodiene insecticides serving as models have demonstrated their tendency to form intermolecular (2 + 2)-photocycloadditions. Because of spatial obstructions by bridges and chlorine atoms in double-bond positions such chlorinated double bonds do not participate in the photoreactions. The reactions are controlled by the excited non-chlorinated double bonds and occur therefore only in substances exhibiting double bonds in their non-chlorinated parts. If a solid cyclodiene insecticide exhibits the necessary structural pre-requisite, UV irradiation will also induce intramolecular (2 + 2)-photocycloadditions. In irradiation experiments of model cyclodienes applied as thin films on glass plates polymerization and elimination reactions took place. After 5 hr more than 50% of the model substances irradiated were thus transformed with the yield of (2 + 2)-

photocycloaddition products fluctuating between 4 and 21% depending on the cyclodiene. Intra-molecular photoreactions occurred in fewer instances than inter-molecular photoreactions.

81-0391. Wolfe, N. L. (Environ. Res. Lab., US EPA, Athens, GA 30605) **Organophosphate and organophosphorothionate esters: application of linear free energy relationships to estimate hydrolysis rate constants for use in environmental fate assessment.** *Chemosphere* 9(9): 571-579; 1980 (28 references).

A discussion is presented in which linear free energy relationships (LFERs) are correlated to hydrolysis rate constants of organophosphate and organophosphorothionate esters in order to estimate their environmental fates. *O,O*-dialkyl-*O*-substituted phosphates will undergo alkaline hydrolysis slowly at most environmental pH values. *O,O*-dialkyl-*O*-substituted phosphorothionates are less reactive than the corresponding phosphate esters. *O,O,O*-triaryl phosphates, at pH 8, are predicted to have very short half lives. When the half lives are estimated to be on the order of a year, they are satisfactory for fate assessments. When half lives are short (months), then an experimentally determined rate constant might be used. Compounds that are susceptible to alkaline hydrolysis often have half-lives on the order of a few hr. For these, an estimate of the rate constant could be adequate for fate assessment.

81-0392. Worobey, B. L. (Univ. Manitoba, Winnipeg, Manitoba, Canada) **Physicochemical studies of the mechanism of complexation and release of 4-chloroaniline from soil and soil humic acids.** *Diss. Abstr. Int. B* 41(5): 1782-1783; 1980.

Research was conducted to develop a method to release and quantitate bound or tightly complexed 4-chloroaniline from soil humic acids. The nature of the humic acid adsorbent was studied to elucidate possible sites and mechanisms of its interaction with 4-CA. Mild extraction techniques were used to isolate the humic acid from soil and its structure was characterized using IR spectrophotometry and ^{13}C-FT-NMR or ^{13}C-NMR. Finally an attempt was made to explain the mechanism of binding of 4-CA to soil humic acids. Pesticide-derived 4-chloroaniline residues are immobilized in soil by interaction with the soil matrix and its components, especially humic acids and clays. Tightly complexed 4-chloroaniline was released from treated soil humic acids by pyrolysis techniques. Recoveries were low and non-reproducible precluding the use of this procedure as an analytical method. An evaluation of several alternative methods of release resulted in development of an analytically acceptable method based upon alkaline hydrolysis and quantitation of 4-chloroaniline as it N-heptafluorobutyl (HFB) derivative by electron capture-GLC. The results of these studies have provided some insight into the mechanisms of 4-chloroaniline interactions with soil and especially soil humic substances, culminating in a *de novo* theory of complexation. According to this theory, 4-chloroaniline and possible other xenobiotics interact with the soil matrix via three prominent mechanisms mediated by interaction of 4-CA with soil humic acid micelles. The relative importance of each kind of complexation will depend on the physico-chemical characteristics of the soil and xenobiotic involved. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms.)

81-0393. Anderson, M. L. (Univ. Michigan, Ann Arbor, MI 48104) **Degradation of polychlorinated biphenyls in sediments of the Great Lakes.** *Diss. Abstr. Int. B* 41(5): 1878-1879; 1980.

Polychlorinated biphenyls (PCBs) are a class of toxic industrial compounds that have become widely distributed in the environment. Some of the compounds released to the environment have accumulated in sediments of lakes and rivers. One process which removes PCBs from the environment is bacterial degradation. The degradation of chlorinated biphenyl compounds by bacteria has been studied in liquid culture but little work has been done with bacteria in sediments. The present study has determined the rates of bacterial degradation of chlorinated biphenyl compounds in sediments incubated under controlled laboratory conditions. Some of the factors affecting the rate of degradation have been investigated, and a comparison with the actual degradation that has occurred in sediments of the Great Lakes is made. Conventional packed column gas chromatography analysis (GC) for PCB mixtures was found to be unsuitable for identifying and quantifying the individual PCB isomers in environmental samples. A capillary column GC technique was developed which permitted the separation and quantification of individual isomers. Chlorobiphenyls added to incubated sediments were found to degrade only under aerobic conditions. The PCB and chlorinated hydrocarbon pesticide profiles in a sediment core from the eastern basin of Lake Erie were found to agree well with the sedimentation rate calculated by ^{137}Cs dating techniques and historical usage patterns of the compounds. Analysis of the chlorobiphenyls in the core of capillary GC indicated that, while the di- and trichlorobiphenyls decreased in the sediments, there were no significant changes in the isomeric profile with depth. Losses due to bacterial degradation occur primarily in aerobic zones near the sediment-water interface. The rate of volatilization of chlorobiphenyls from the solution phase of a sediment-water system is influenced by a number of factors. As a result measured rates of volatilization of chlorobiphenyls were smaller than expected. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8025646)

81-0394. Terman, C. R.; Huggett, R. J. (Lab. Endocrinol. & Popul. Ecol., Biol. Dep., Coll. William & Mary, Williamsburg, VA 23185) **Occurrence of Kepone in white-footed mice *(Peromyscus leucopusnoveboracensis)* on Jamestown Island, Virginia.** *Environ. Int.* 3(4): 307-310; 1980 (11 references).

A study of white-footed mice on Jamestown Island was begun in 1978 following the detection of Kepone (chlordecone) in the James River in 1975. All mice captured were shown to contain Kepone. Significantly greater levels of Kepone were found in the livers of animals taken on the peninsular study areas than those taken on Black Point or on the inland site sampling areas. Black Point mice had significantly higher levels than inland mice. This is the first record of significant findings of Kepone in a terrestrial food chain and suggests movement up the chain. Finding of Kepone in mice from the inland forest is significant because the only source of Kepone to this area was from a very small stream which was contaminated in the area tributary to the James River.

81-0395. Koivusaari, J.; Nuuja, I.; Palokangas, R.; Finnlund, M. (Dep. Zool., Univ. Kuopio, 70100 Kuopio 10, Finland) **Relationships between productivity, eggshell thickness and pollutant contents of addled eggs in the population of white-tailed eagles *Haliaetus albicilla* L. in Finland during 1969-1978.** *Environ. Pollut.* 23(1): 41-52; 1980 (27 references).

A study was conducted from 1969 to 1978 in which pollutant levels were related to eggshell thickness of addled eagle eggs in Finland. Six breeding territories of the white-tailed eagle were surveyed for addled eggs. Pieces of egg shell were collected and analyzed, the contents of addled eggs were analyzed for residues, and reproductive activity was estimated by a census. The thickness of eggshells increased in 4 territories and decreased slightly in 2. Productivity increased in 6 territories. Mercury levels were 2.59 ppm (dry wt arithmetic mean). The PCB content averaged 583 ppm (fat wt; fw). The mean DDE concentration was 452 ppm (fw). The DDE content decreased during the 1970s. PCB and mercury levels, however, were stable. It is suggested that the increase in productivity is a function of the decrease of DDE, which is possibly due to the ban on DDT.

81-0396. Anonymous **From wind tunnel to wing tip.** *Farm Chem.* 143(11): 26, 29, 32, 34, 37; 1980.

Problems associated with pesticide drift are discussed. Aerial movement of the pesticide from the point of emission to non-target areas should be decreased not only because of possible harmful environmental and health effects but also for economic reasons. Many contact and non-volatile pesticides will not suffice in pest control if accurate placement cannot be controlled. Also the use of reduced concentrations increase the need for drift control. Attempts to improve spray pattern uniformity, swath guidance accuracy and to control or modify spray-wake movements are being investigated. Improvement of droplet size control is also considered an important drift reduction method.

81-0397. Alekperov, I. I. (M. M. Efendi-zade Res. Inst. Ind. Hyg. & Occup. Dis., Sumgait, USSR) **Aktual'nye voprosy gigieny truda khlopkorobov. [Current problems of the industrial hygiene of cotton-growers.]** *Gig. Sanit.* 45(10): 38-40; 1980 (7 references) (Russian).

Various occupational factors affecting cotton-growers are discussed. High temperature and dust content of the air can be conducive to development of diseases of the respiratory organs, skin and mucous membranes of the eyes. Average concentration of butifos (DEF) vapors in the working zone of cotton-growers ranged from 1.4 to 1.92 mg/m^3, which exceeded by 3 to 4 times the maximum permissible concentration of this pesticide.

81-0398. Quilt, P.; Grossbard, E.; Wright, S. J. L. (Agric. Res. Counc., Weed Res. Organ., Yarnton, Oxford OX5 1PF, England) **Effects of the herbicide barban and its commercial formulation Carbyne on nitrification in soil.** *J. Appl. Bacteriol.* 49(2): 255-263; 1980 (8 references).

The effects of the herbicide barban on soil nitrification were studied. Barban and its commercial formulation Carbyne were applied at rates of 200 ppm (oven dry basis). Soil samples were incubated at 25°C and analyzed every 2 wk. Periodically fresh soil was added. Another set of samples was treated with 5, 10 or 50 ppm chloroaniline. Samples were analyzed at time zero and after 1, 2, and 4 wk. After 18 wk, no *Nitrosomonas* or *Nitrobacter* could be detected in the soil in the first experiments. Periodic introductions of fresh soil and NH_4^+-N failed to re-establish nitrification. The 50 ppm 3-chloroaniline treatment inhibited nitrification temporarily. It appears that the undegraded pesticide is essential for inhibition, and that degradation products alone are not harmful to the processes studied.

81-0399. Beyer, W. N.; Gish, C. D. (Patuxent Wildl. Res. Cent., Laurel, MD 20811) **Persistence in earthworms and potential hazards to birds of soil applied DDT, dieldrin and heptachlor.** *J. Appl. Ecol.* 17(2): 295-307; 1980 (33 references).

Several plots in hay fields were treated with DDT, dieldrin and heptachlor at concentrations of 0.6, 2.2 or 9.0 kg/ha. Over the following 11 yr period samples of earthworms and soil were analyzed for residues of the applied compounds. Residues in earthworms were significantly higher than in soils; the average ratios of these residues was 5:1 for DDT, 8:1 for dieldrin, and 10:1 for heptachlor

epoxide. DDT residues in soil were reduced by 50% in 3.2 yr. Corresponding times for dieldrin and heptachlor epoxide were 5.1 yr and 3.2 yr, respectively. Residues reached 50% of their maximum level in earthworms after 3.2, 2.6 and 3.0 yr, respectively. The most persistent metabolite found was DDE. Levels of 32 ppm were found in earthworms from areas treated with 9.0 kg/ha DDT. This level is hazardous to bird species feeding on these worms. Heptachlor applied at 2.2 or 9.0 kg/ha yielded levels hazardous to the woodcock (8 ppm). Dieldrin was hazardous to birds after 3 yr in plots treated with 2.2 kg/ha and remained hazardous for 11 yr in plots treated with 9.0 kg/ha.

81-0400. Chapman, R. A.; Harris, C. R. (Res. Inst., Agric. Canada, London, Ontario N6A 5B7, Canada) **Insecticidal activity and persistence of terbufos, terbufos sulfoxide and terbufos sulfone in soil.** *J. Econ. Entomol.* 73(4): 536-543; 1980 (30 references).

Terbufos, terfubos sulfoxide, and terbufos sulfone are toxic, broad spectrum contact insecticides which were ~ 8.33%, 33%, and 20%, respectively, as toxic as carbofuran to 24-48 hr field crickets, *Acheta pennsylvanicus* (Burmeister). In moist Plainfield sand, terbufos was nearly 10 times more toxic to crickets than was carbofuran, while the sulfoxide and sulfone were ~ 75% and 25% as toxic, respectively. The insecticidal activity was influenced by soil type, moisture, and temperature. Terbufos was sufficiently volatile to cause fumigant toxicity to crickets placed above treated soil whereas the sulfoxide and sulfone were not. In laboratory tests, chemical analysis showed that terbufos sulfoxide and terbufos sulfone were ~ equally persistent in soil; terbufos was less persistent. Oxidative processes were observed to be important in the disappearance of both terbufos and terbufos sulfoxide and to proceed more rapidly in muck than in sand. Bioassay studies indicated that, in sand, the biological activity arising from the application of terbufos was due, primarily, to the persistence and high insecticidal activity of the parent material. In a field study in which granular formulations of terbufos and phorate were incorporated into soil, both insecticides were more persistent, and the amounts of parent compounds oxidized to their respective sulfoxides and sulfones were greater in muck than in sand. Residues in carrots and radishes grown on treated soil were slightly higher, and the persistence of residues in these soils was slightly greater for terbufos than for phorate. (Author abstract by permission)

81-0401. Ciesla, W. M.; Livingston, R. L. (Methods Appl. Group, For. Insect & Dis. Manage., For. Serv., USDA, Davis, CA 95616) **Using the D-max method for estimating atomization of water-base sprays.** *J. Econ. Entomol.* 73(4): 615-616; 1980 (6 references).

Estimates of atomization of an aqueous spray applied by aircraft were obtained by the D-max method and Quantimet image analyzer and compared. Results indicate that the D-max method is a reliable technique for making rapid field estimates of droplet VMD for aqueous as well as oil-base tank mixes. (Author abstract by permission)

81-0402. Johnsen, T. N., Jr. (Agric. Res., SEA, USDA, Tucson, AZ 85719) **Picloram in water and soil from a semiarid pinyon-juniper watershed.** *J. Environ. Qual.* 9(4): 601-605; 1980 (19 references).

A mixture of picloram at 2.8 kg acid equivalent (ae)/ha and 2,4-D at 5.6 kg acid equivalent/ha was aerially applied onto 113 ha of a 146-ha pinyon-juniper watershed [*Juniperus osteosperma* (Torr.) Little and *Pinus edulis* Engelm., respectively] in north-central Arizona. Picloram residues in runoff water and soil were monitored. Picloram was detected in runoff water leaving the treated area for 30.5 mo after application. The highest concentration, 320 ppbw, was in the initial runoff after treatment. A total of 1.1% of the picloram applied left the treated area in runoff water. Picloram was not detected farther than 5.6 km downstream. The picloram concentration was relatively constant during runoff events unless water from snow melt or from an untreated area mixed with the runoff from the treated area. Less picloram came from an area with individually treated trees than from an area with broadcast application. Dip (grab), single-stage flood, or splitter-box water samples all gave comparable picloram contents from the same location with the same runoff event. Picloram was detected in the soils for 44 mo, mainly below the 45-cm depth down to bedrock at 122 cm. (Author abstract by permission)

81-0403. Moreale, A.; Van Bladel, R. (Univ. Louvain, B-1348 Louvain-la-Neuve, Belgium) **Behavior of 2,4-D in Belgian soils.** *J. Environ. Qual.* 9(4): 627-633; 1980 (32 references).

This investigation was conducted to determine the physicochemical parameters of soils useful in predicting the adsorption and movement of 2,4-D in selected soils (surface and subhorizons) from the sandy and loam regions of Belgium. A statistical analysis showed that organic matter, soil pH (surface horizons), and exchangeable aluminum (subhorizons) could be used as key characteristics in the quantitative determination of the percentage of 2,4-D adsorbed. Adsorption isotherms demonstrated that changing the initial concentration of 2,4-D in solution (0.01-10 ppm) was of negligible importance in determining key soil properties related to the percentage of 2,4-D adsorbed. Desorption data were significantly correlated ($r = -0.96$) with the percentage of 2,4-D initially adsorbed. The overall effect of increasing the ionic strength of the calcium chloride ($CaCl_2$) solution was to enhance 2,4,-D adsorption. However, this effect was relatively small between 0.075 and 0.75 ionic strength. Degradation of 2,4-D added

at a rate of 10 μg/g of soil (soil/solution ratio 1:1) was followed by CO_2 evolution resulting from the oxidation of [carboxyl-^{14}C] 2,4-D. Within 1 mo of incubation, extensive degradation occurred in neutral soils, but the degradation rate was considerably lower in acid soils. Leaching experiments indicated that 2,4-D mobility was inversely related to the amount of 2,4-D adsorbed. After 62 days of leaching in a Podzol soil column, 1 m long, the recovery of 2,4-D nondegraded in the profile was only 7% of the initial application rate. No trace of the herbicide was detected in the column effluent for this period. (Author abstract by permission)

81-0404. Edwards, W. M.; Triplett, G. B., Jr.; Kramer, R. M. (Agric. Res., SEA, USDA, Coshocton, OH 43812) **A watershed study of glyphosate transport in runoff.** *J. Environ. Qual.* 9(4): 661-665; 1980 (18 references).

Glyphosate formulated as Roundup herbicide was applied on 0.3-3.1 ha watersheds at rates of 1.10, 3.36, and 8.96 kg/ha as a preseeding herbicide in the no-tillage establishment of fescus (*Festuca arundinacea* L.) and corn (*Zea mays* L.). Runoff from natural rainfall following early springtime treatments was measured and analyzed to define concentration and transport of glyphosate under these conditions. The highest concentration of glyphosate (5.2 mg/l) was found in runoff occurring 1 day after treatment at the highest rate. Glyphosate (2 μg/l) was detected in runoff from this watershed up to 4 mo after treatment. For the lower application rates, maximum concentration of the herbicide in runoff was < 100 μg/l for events occurring 9-10 days after application and decreased to < 2 μg/l within 2 mo of treatment. The maximum amount of glyphosate transport by runoff was 1.85% of the amount applied, most of which occurred during a single storm on the day after application. In each of the 3 study years, herbicide transport in the first runoff event following treatment accounted for 99% of the total runoff transport on one watershed. Glyphosate residues in the upper 2.5 cm of treated soil decreased logarithmically with the logarithm of time; they persisted several weeks longer than in the runoff water. (Author abstract by permission)

81-0405. Wauchope, R. D.; Leonard, R. A. (South. Weed Sci. Lab., Stoneville, MS 38776) **Maximum pesticide concentrations in agricultural runoff: a semiempirical prediction formula.** *J. Environ. Qual.* 9(4): 665-672; 1980 (36 references).

Using data compiled from the literature on the concentrations of pesticides observed in runoff water, a semiempirical prediction formula has been constructed which is very crude, but which should be useful to water-quality planners for estimating worst-case pesticide inputs from agricultural sources. The maximum edge-of-field pesticide concentrations in individual runoff events can be predicted within about one order of magnitude if the pesticide formulation, use, and application rate are known, together with the time elapsed between application of the pesticide and subsequent runoff events. Pesticides are grouped into 4 broad classes according to their availability for runoff loss. (Author abstract by permission)

81-0406. Camper, N. D.; Stralka, K.; Skipper, H. D. (Dep. Plant Pathol., Clemson Univ., Clemson, SC 29631) **Aerobic and anaerobic degradation of profluralin and trifluralin.** *J. Environ. Sci. Health B* 15(5): 457-473; 1980 (17 references).

Differences in the aerobic and anaerobic degradation of the herbicides profluralin and trifluralin were studied. Soil samples enriched with ^{14}C-ring labeled and unlabeled herbicides were incubated under both conditions. Soil microorganisms were enumerated at the beginning of the experiment. At monthly intervals the soil samples were extracted and analyzed for breakdown products and radioactivity. The greatest rate of degradation of profluralin was aerobic in Cecil loamy sand soil, 86% after 4 mo with 3 breakdown products. In the same soil, trifluralin was degraded 83% in 4 mo leaving 2 products. Degradation of profluralin and trifluralin was 72 and 78%, respectively, under anaerobic conditions.

81-0407. Thomas, V. M.; Holt, C. L. (Pestic. Metab. Sect., Mountain View Res. Cent., Stauffer Chem. Co., Mountain View, CA 94042) **The degradation of ^{14}C-molinate in soil under flooded and non-flooded conditions.** *J. Environ. Sci. Health B* 15(5): 475-484; 1980 (4 references).

Studies were performed to compare the differences in the degradation of the herbicide molinate in soil under flooded and non-flooded conditions. Glass jars containing 300 g of air dried soil were incubated with 3.5 ml of acetone containing 1.26 mg ^{14}C-molinate (4.2 ppm). Half of the jars were adjusted to 15% humidity, and the remainder were flooded with a 6 cm layer of water above the soil. At intervals from 0 to 32 wk samples were removed and analyzed for radioactivity and breakdown products. Under moist conditions 50% of the molinate was lost in 3 wk. In the flooded conditions, however, it took 10 wk for 50% of the molinate to be lost. It was shown that in flooded conditions volatilization was the mechanism of loss. Non-flooded tests showed that a variety of degradation pathways occurred.

81-0408. Balasubramanya, R. H.; Patil, R. B.; Bhat, M. V.; Nagendrappa, G. (Cotton Technol. Res. Lab., Matunga, Bombay-19, India) **Degradation of carboxin (vitavax) and oxycarboxin (plantvax) by *Pseudomonas aeruginosa* isolated from soil.** *J. Environ. Sci. Health B* 15(5): 485-505; 1980 (22 references).

Studies were performed which demonstrated and described the degradation of the fungicides carboxin and oxycarboxin by soil bacteria. *Pseudomonas aeruginosa* was isolated from red sandy loam soil perfused with these substances. The bacteria were grown in medium containing carboxin and oxycarboxin as sole sources of carbon and nitrogen. The metabolic intermediates were isolated by a chromatographic method and identified by physical, chemical and spectral methods. Carboxin was oxidized to a sulfoxide then a sulfone, then hydrolyzed, eventually leading to a build-up of ammonia which is oxidized to nitrite. Oxycarboxin was hydrolyzed via the compound 2-(vinylsulfonyl) acetanilide, liberating 2-(2-hydroxyethylsulfonyl) acetic acid and aminophenol. Nitrite, via the oxidation of ammonia, was also the end product of this degradation.

81-0409. Kapoor, S. K.; Chawla, R. P.; Kalra, R. L. (Dep. Entomol., Punjab Agric. Univ., Ludhiana, India) **Contamination of bovine milk with DDT and HCH residues in relation to their usage in malaria control program.** *J. Environ. Sci. Health B* 15(5): 545-557; 1980 (9 references).

A study was performed in which the spraying of DDT and HCH (BHC) for malaria control was correlated with pesticide levels in bovine milk. Ten to 16 milk samples from individual water buffalo were collected from randomly selected rural areas from 2 districts sprayed recently with DDT and from 2 districts recently sprayed with HCH. Identification of the pesticides in the samples was by thin layer chromatography and gas-liquid chromatography. DDT and HCH were found in all samples collected. A direct correlation was found between the concentrations of these 2 pesticides in milk and their use in malaria control.

81-0410. Reimer, G. J.; Webster, G. R. B. (Pestic. Res. Lab., Dep. Soil Sci., Univ. Manitoba, Winnipeg, Manitoba R3T 2N2, Canada) **Loss of chlorpyrifos in pond water: examination of results using three simple mathematical models.** *J. Environ. Sci. Health B* 15(5): 559-569; 1980 (7 references).

Studies were performed to determine the loss rates of chlorpyrifos from experimental ponds. Doses of 0.04 mg/l were put in each of four pools, two as the 2.5% slow release formulation and two as 48% emulsifiable concentrate. Water samples collected at various intervals were extracted with methylene chloride and analyzed by gas-liquid chromatography. The emulsified formulation had a half-life of 5 hr and the slow release formulation had a half-life of 14 hr. Three different mathematical models (power rate model, hyperbolic rate model, and empirical power function) were used to describe the concentration-time data, giving correlation coefficients of 0.78, 0.84 and 0.76, respectively. It was concluded that the models described the system equally well.

81-0411. Osterroht, C.; Smetacek, V. (Inst. Meeresk., Univ. Kiel, D-2300 Kiel 1, BRD) **Vertical transport of chlorinated hydrocarbons by sedimentation of particulate matter in Kiel Bight.** *Mar. Ecol. Progr. Ser.* 2(1): 27-34; 1980 (35 references).

The amount of chlorinated hydrocarbons reaching sediments in sinking organic matter in the Kiel Bight area during a 2 yr period was investigated. Seasonal trends, possibly linked to factors which control the sedimentation process, were studied. Land runoff into this area is minimal; the watershed in Schleswig-Holstein lies close to the eastern coast and no major industrial centers are present in this region. A decline was found in the amount of pesticide residues entering the sediments from 1976 to 1977. It is suggested that the ban on the use of DDT and restrictions on the use of other chlorinated hydrocarbon pesticides over the past several years may have been responsible for this decline. Surface sediments contained measurable amounts of all organochlorine compounds sought with the exception of DDD (TDE). The rate of input of PCBs to the sediments appears seasonal and is presumably due to the seasonality in input to the sea surface as well as to the annual cycle of sedimentation.

81-0412. Anonymous **Chlorinated hydrocarbons in sewage.** *Mar. Pollut. Bull.* 11(10): 276; 1980 (1 reference).

Each day 300 *l* of settled sewage were added to a basin measuring 65 m^3 and 0.6 m deep in the lagoon of Strunjan in the Northern Adriatic. Determinations were made of the PCB and pesticide (aldrin, DDT and dieldrin) content of fauna and sediments from lagoons and offshore waters up to 14 nautical miles from the coast. Sedimentation in the polluted basin contained 3 fold the concentration of DDT and derivatives as well as PCBs than did a similar nonpolluted basin. An increase on pollutant concentration was noted in the sea samples with decreased distance from shore. Holothurians (deposit feeders) and mussels (filter feeders) contained a 2 to 3-fold increase in chlorinated hydrocarbons. Crabs (predators and scanvengers) did not exhibit this increase.

81-0413. Stone, W. B.; Kiviat, E.; Butkas, S. A. (New York State Dep. Environ. Conserv., Albany, NY) **Toxicants in snapping turtles.** *N. Y. Fish Game J.* 27(1): 39-50; 1980 (15 references).

Results are reported of analysis of organochlorine contaminants in selected tissues of 32 snapping turtles from New York waters (23 from the Hudson River and 9 from other localities). Fat, liver, skeletal muscle and eggs were analyzed by gas chromatography. PCBs were found in all samples; the highest was found in fat of turtles from the Hudson River (mean = 2990.60 ppm). Of the 17 fat samples tested for dieldrin, 10 had high concentrations (> 0.3 ppm). Of the 16 tested for DDE, 5 had concentrations > 5 ppm. It is suggested that turtles from the Hudson River

and from some other localities are unfit for human consumption due to contamination with such persistent pollutants.

81-0414. Pottinger, R. P. (Soil & Plant Res. Stn., Ruakura, New Zealand) **Keeping kiwifruit clean.** *N. Z. J. Agric.* 141(1): 49-51; 1980.

Studies are underway to improve the spraying of kiwifruit in order that the growers of the crop will not be deprived of foreign markets due to residue levels of pesticides on their products. Tolerance levels in various countries for gusathion (azinphos-methyl), imidan (phosmet), or benlate (benomyl) are discussed. The levels differ for various countries, but the process used for setting the levels generally involves testing for acute toxicity, short-term effects, genetic mutations, carcinogenic properties, reproductive effects, abnormal growth, biochemical aspects, metabolism and long-term effects in man. Factors which affect the quantity of residues remaining on the crop include application and method, size and surface characteristics of the fruit, pesticide persistence, and residue location. Based on results of studies performed on the kiwifruit, additional fruits are being examined including blackcurrants, blueberries, feijoas, avocados and passionfruit, and apples and boysenberries. As improvement occurs in the management of plant pests, new spraying schedules will be introduced to more effectively meet the residue requirements of various importing countries.

81-0415. Winchester, R. V.; Keating, D. L. (Chem. Div., Dep. Sci. & Ind. Res., Petone, New Zealand) **Trace metal and organochlorine pesticide residues in New Zealand farmed oysters: a preliminary study.** *N. Z. J. Sci.* 23(2): 161-169; 1980 (32 references).

Oysters collected from oyster farms in eight different areas of New Zealand were analyzed for trace metals and organochlorine pesticide residues. In general, 12 oysters from each area were collected, and the soft portion of each oyster was homogenized and digested. Trace metals were analyzed by AAS, and selenium and organochlorine pesticides by gas chromatography. It is pointed out that even though this preliminary survey was on a limited scale, the ranges of trace metal concentrations, with few exceptions, are similar to those found in other countries, and within the range that would be excepted for shellfish in relatively unpolluted waters. Zinc levels are similar to those reported elsewhere, but exceed, by a wide margin, food and drug regulations. Occasional high cadmium levels (up to 46 μg/g wet wt) were found. Arsenic (possibly due to the wood preservatives used on the platform) exceeded the New Zealand permissible levels. Copper, chromium, iron, manganese, mercury, lead, selenium, and antimony levels were similar to those found elsewhere and indicated no degree of hazard. Pesticide levels were extremely low; no aldrin, dieldrin, or DDT isomers were found. *p,p'*-DDE was seen at levels of 0.003 to 0.005 μg/g, and faint traces of lindane were found in two samples.

81-0416. O'Shea, T. J.; Brownell, R. L., Jr.; Clark, D. R., Jr.; Walker, W. A.; Gay, M. L.; Lamont, T. G. (Patuxent Wildl. Res. Cent., Fish & Wildl. Serv., US Dep. Inter., Laurel, MD 20811) **Organochlorine pollutants in small cetaceans from the Pacific and South Atlantic Oceans, November 1968 – June 1976.** *Pestic. Monit. J.* 14(2): 35-46; 1980 (25 references).

Organochlorine residues were analyzed in blubber, brain, or muscle tissues of 69 individuals representing 10 species of small cetaceans. Collections were made from November 1968 through June 1976 at localities in the Eastern Tropical Pacific and along the coasts of California, Hawaii, Japan, and Uruguay. Relations of residue concentrations between tissues are described for DDE and PCBs in two dolphin species. ΣDDT and PCB residues in blubber of most of the 19 individuals of the five southern California species sampled exceed concentrations that are associated with reproductive impairment in pinnipeds, although the nature of such associations is not well defined. The Σ-DDT residue of 2695 ppm in blubber of one California coastal *Tursiops truncatus* is one of the highest concentrations reported in tissues of members of any population of wild mammals. Except for one rough-toothed dolphin *(Steno bredanensis)* from Maui, Hawaii, all individuals from all localities surveyed were contaminated with organochlorine compounds. Seventeen different organochlorines were detected; greatest diversity occurred near Japan and California. This is the first report of several of these compounds in tissues of any species of marine mammals. The *o,p'*-isomers and metabolites of DDT were detected unusually frequently. Ratios of *p,p'*-DDT to *p,p'*-DDE in blubber of cetaceans from waters off countries where use of this pesticide has been relatively recent and ongoing were at least an order of magnitude higher than in cetaceans from United States waters.

81-0417. Leard, R. L.; Grantham, B. J.; Pessoney, G. F. (Bur. Mar. Resour., Long Beach, MS 39560) **Use of selected freshwater bivalves for monitoring organochlorine pesticide residues in major Mississippi stream systems, 1972-73.** *Pestic. Monit. J.* 14(2): 47-52; 1980 (8 references).

Seven species of freshwater Pelecypoda, *Amblema costata, Corbicula manilensis, Elliptio crassidens, Lampsillis anadontoides, Lampsilis claibornensis, Megalonaias gigantea,* and *Plectomerus dombeyanus,* were collected and monitored for pesticide content during 1972 and 1973. Thirteen collection sites, representing five major river basins in the state of Mississippi, were sampled and compared. During the 24-mo study, 26 water samples and 58 clam samples from the five river basins were analyzed. In-

dividual samples weighed from 8 g to 20 g and consisted of 1-30 clams, depending on size. Residues of toxaphene and methyl parathion were found only in 1973 water samples. The study shows that freshwater clams are effective monitors of pesticide content. The tendency of clams to concentrate pesticides and their corresponding ability to eliminate them varies with species. Significant reductions in DDT and a corresponding buildup of *p,p'*-TDE were noted in 1973, following the limitations on the use of DDT and large-scale flooding throughout the state. (Author abstract by permission)

81-0418. Haseltine, S. D.; Mulhern, B. M.; Stafford, C. (Patuxent Wildl. Res. Cent., Fish & Wildl. Serv., US Dep. Inter., Laurel, MD 20811) **Organochlorine and heavy metal residues in black duck eggs from the Atlantic Flyway, 1978.** *Pestic. Monit. J.* 14(2): 53-57; 1980 (16 references).

Black duck *(Anas rubripes)* eggs were collected during 1978 in the Atlantic Flyway. One egg from each of 49 clutches was analyzed for organochlorine compounds and mercury. DDE was detected in 39 eggs, ranging from 0.09 ppm to 3.4 ppm, wet wt. DDE residues were highest in eggs from Delaware, where the mean DDE level was 2.0 ppm. DDT and TDE were present at low levels in only 5 and 4 eggs, respectively. PCBs resembling Aroclor 1260 were detected in 24 eggs and ranged from 0.43 ppm to 2.9 ppm. Eggs from Massachusetts and Rhode Island contained an average of > 1.0 ppm PCBs, but eggs from Nova Scotia, Pennsylvania, Maryland, and Virginia contained no detectable PCBs. Dieldrin, oxychlordane, and heptachlor epoxide were present in a few samples at low levels. Mercury was detected in 31 eggs, ranging from 0.07 ppm to 0.34 ppm, wet wt. Twenty eggs analyzed for chromium, copper, and arsenic contained averages of 0.64 ppm, 1.7 ppm, and 0.18 ppm, respectively. No geographic pattern was observed in these metal residue levels. Eggshell thickness (0.347 mm) was identical to the pre-1946 norm. (Author abstract by permission)

81-0419. White, D. H.; King, K. A.; Prouty, R. M. (Gulf Coast Field Stn., Patuxent Wildl. Res. Cent., Fish & Wildl. Serv., US Dep. Inter., Victoria, TX 77901) **Significance of organochlorine and heavy metal residues in wintering shorebirds at Corpus Christi, Texas, 1976-77.** *Pestic. Monit. J.* 14(2): 58-63; 1980 (28 references).

Organochlorine and heavy metal residues were determined in 103 shorebirds of seven species collected at Corpus Christi, Texas, during the winter of 1976-77 to evaluate their potential effects on population survival. DDE and polychlorinated biphenyls (PCBs) were detected in most samples. Chlordane isomers, dieldrin, toxaphene, and heptachlor epoxide also occurred, but less frequently. In general, organochlorine residues were low in skinned carcasses. Geometric means on a wet wt basis ranged from 0.25 ppm to 4.76 ppm for DDE and from 0.67 ppm to 6.64 ppm for PCBs; residues of the other compounds averaged less than 1 ppm in all instances. Mercury, lead, arsenic and vanadium occurred in all shorebird livers, and selenium and cadmium were detected in all kidneys. Residues of these metals, except selenium, were low in most tissue samples. Selenium averages varied from 1.77 ppm to 5.62 ppm (wet wt) in kidneys; residues in this range may be sufficient to inhibit reproduction or to induce other forms of toxicity, especially at the higher levels. (Author abstract by permission)

81-0420. Spalding, R. F.; Junk, G. A.; Richard, J. J. (Conserv. & Surv. Div., Inst. Agric. & Nat. Res., Univ. Nebraska, Lincoln, NE 68588) **Pesticides in ground water beneath irrigated farmland in Nebraska, August 1978.** *Pestic. Monit. J.* 14(2): 70-73; 1980 (17 references).

During the 1978 irrigation season, 14 ground water samples were collected in the Central Platte region of Nebraska, an area known to have high nitrate-nitrogen (NO_3-N) levels, and analyzed for the presence of 13 residues. Atrazine levels ranged from 0.06 μg/l to 3.12 μg/l and were correlated to NO_3-N concentrations with a coefficient of $r = +0.55$. Nitrate-nitrogen concentrations were measured as indicators of deep percolation from irrigated lands and ranged from 17.1 mg/l to 34.3 mg/l. Alachlor levels ranged from < 0.01 μg/l to 0.71 μg/l. The amounts of 2,4-D were indeterminate because of experimental problems. Levels of the herbicides silvex and EPTC were below the limits of detectability. Levels of the organochlorine insecticides endrin, γ-BHC (lindane), dieldrin, DDT and its primary metabolite DDE, heptachlor and its primary derivative heptachlor epoxide, and methoxychlor were all below the detectable limits of 0.005-0.010 μg/l. (Author abstract by permission)

81-0421. Cooke, L. R.; Clifford, D. R.; Gendle, P.; Holgate, M. E. (Long Ashton Res. Stn., Univ. Bristol, Bristol BS18 9AF, England) **A trial to determine the persistence of carbendazim pressure-injected into elms.** *Pestic. Sci.* 11(3): 301-304; 1980 (11 references).

The persistence of carbendazim in elm twigs, after pressure-injection of the commercial formulation Lignasan into the trunks, was monitored by bioassay. Initial distribution was poor (38% of twigs contained no detectable fungitoxicant) and after 53 days carbendazim was detected in only 19% of the twigs. In groups of control and injected trees inoculated with *Ceratocystis ulmi* (the cause of Dutch elm disease) on one of five dates between July and September, disease development was limited and a significant ($P = 0.05$) reduction in symptoms in injected trees was detected only in those inoculated on the first date (2 July 1976). Both the very erratic distribution of fungitoxicant and the restricted disease development, which precluded

demonstration of a correlation between fungitoxicant level at inoculation and subsequent symptom expression, were attributed to the effects of the abnormally hot, dry summer in 1976. (Author abstract by permission)

81-0422. Smith, A. E. (Res. Stn., Agric. Canada, Regina, Saskatchewan S4P 3A2, Canada) **An analytical procedure for bromoxynil and its octanoate in soils; persistence studies with bromoxynil octanoate in combination with other herbicides in soil.** *Pestic. Sci.* 11(3): 341-346; 1980 (20 references).

A method is described for the analysis of the herbicide bromoxynil and its octanoate in soils. Following extraction with aqueous acidic acetonitrile, the octanoate was separated from the phenolic bromoxynil by solvent partitioning. The ester and the phenol were assayed by gas-liquid chromatography without further modification or preparation of a derivative. Recoveries in excess of 93% were obtained from soils treated with the phenol and the ester at levels of 0.5 or 0.1 μg/g. The persistence of bromoxynil octanoate applied at a rate of 3 μg/g was studied in the laboratory on a heavy clay and a sandy loam at 85% of field capacity moisture and 20 ± 1°C, both alone and in the presence of 2,4-D (2 μg/g); MCPA (2 μg/g); MCPA + asulam (Both at 2 μg/g); and MCPA + difenzoquat (both at 2 μg/g). In each soil there was a rapid conversion of bromoxynil octanoate to the free phenol, which then underwent a rapid degradation, so that after 7 days, over 90% of the original treatment had disappeared. There appeared to be no effect on bromoxynil breakdown by any of the herbicides added in combination. Small field plots were treated, in early May 1977 and 1978 at two locations in Saskatchewan, with a combination of commercial formulations containing asulam, bromoxynil octanate, and MCPA at rates of 1 kg/ha each. After 10 wk the plots were sampled and analysis showed that in all cases, no asulam, bromoxynil, or bromoxynil octanoate could be extracted from the top 10 cm of soil. (Author abstract by permission)

81-0423. Allen, J. G. (East Malling Res. Stn., Maidstone, Kent ME19 6BJ, England) **Daminozide residues in sweet cherries, and their determination by colorimetric and gas-liquid chromatographic methods.** *Pestic. Sci.* 11(3): 347-350; 1980 (7 references).

Daminozide residues in fruit from sweet cherry trees were determined over a period of 4 years as part of an investigation into the effects of growth regulators. Analysis was by the usual colorimetric method. Additionally, for the 2 final years, a gas-liquid chromatographic method was developed to determine the 1,1-dimethylhydrazine produced by hydrolysis of daminozide residues and to confirm the results from the first method. (Author abstract by permission)

81-0424. Suett, D. L.; Padbury, C. E. (Natl. Veg. Res. Stn., Wellesbourne, Warwick CV35 9EF, England) **Uptake of phorate by lettuce.** *Pestic. Sci.* 11(3): 351-360; 1980 (24 references).

Following experimental and commercial applications to soil of a granular formation of phorate residues in the soil and in lettuce were determined by gas-liquid chromatography. When applied by the bow-wave method as a continuous logarithmically- changing dose ranging from approximately 0.9 to 16.0 kg AI/ha, the proportional rate of oxidation in soil of phorate sulfoxide to phorate sulfone was inversely related to dose. Ten wk after application, total phorate residues in the soil had declined by about 35% at all dose levels. Residues in mature lettuce, from the 1-5 kg/ha dose-range, comprised the parent and oxygen analogue sulfoxides and sulfones; the relative proportions of the individual metabolites were independent of dose. Over this dose-range, total residue concentrations in the crop became proportionally slightly greater with increasing dose. When single doses of 1.1, 2.0 or 2.2 kg AI/ha were applied at drilling, the total residue concentrations in the lettuce declined from 5 mg/kg in seedlings from some treatments to < 0.05 mg/kg at harvest. In plants raised in peat blocks containing 10 or 20 mg AI per block, however, residues in seedlings totalled 45-47 mg/kg and declined to only 0.7 mg/kg at harvest. It was concluded that bow-wave applications of phorate when field-sowing lettuce were unlikely to lead to unacceptable residues in the harvested crop, but that residues in lettuce raised in phorate-treated peat blocks may be unacceptably high. (Author abstract by permission)

81-0425. Haynes, R. J.; Goh, K. M. (Dep. Soil Sci., Lincoln Coll., Canterbury, New Zealand) **Some observations on surface soil pH, base saturation and leaching of cations under three contrasting orchard soil management practices.** *Plant Soil* 56(3): 429-438; 1980 (22 references).

The effect of the elimination of vegetation from an entire orchard floor on the surface soil pH was investigated. Field studies were conducted on a 11 y old apple orchard in which the surface soil had about 27% clay and 40% silt, a pH of about 6, and organic matter had a C/N ratio of just over 11. Vegetation was removed by clean cultivation or treatment with the herbicide terbacil. The pH down to 15 cm was generally significantly lower in herbicide and cultivated plots than in grass plots. The herbicide and cultivated treatments led to a reduction in total exchangeable bases and % base saturation with a corresponding increase in exchange acidity. The leaching of exchangeable bases from the surface soil of non-grass plots led to an increased exchange acidity with an accompanying drop in measured soil pH. Thus the grass sod results in a higher base saturation of the surface soil. It is noted that this study is significant to orchard trees growing under herbicide soil management. Herbicide treatment has been shown to increase the tree root density and activity in the top 15 cm of soil (associated with a drop in soil pH), which would facilitate soil acidity related plant disorders.

81-0426. Kannan, N.; Anbalagan, K.; Jayaraman, J. (Dep. Biochem., Sch. Biol. Sci., Madurai Kamaraj Univ., Madurai 625021, India) **Impact monitoring of pesticide residues: rice plant *(Oryzae sativa* L.).** *Proc. Indian Acad. Sci. (Plant Sci.)* 89(2): 123-130; 1980 (7 references).

Studies were performed to determine the changes in pesticide concentrations in various parts of rice plants after spraying. On days 54 and 77 after planting pesticides (methyl parathion, fenitrothion, malathion and endosulfan) were applied at a high and a low concentration, 0.01-0.75 kg AI/acre (0.247-1.85 kg AI/ha). Leaves, grain and hay were analyzed. The effects of drying and par boiling on pesticide concentrations were examined. After 15 days levels of methyl parathion (dust application) were 5.25 ppm. Methyl parathion applied as liquid was not detected after 15 days. Other residue levels 15 days after the highest dose were 7.05 ppm fenitrothion, 21.05 ppm malathion, and 12.63 ppm endosulfan. Drying and par boiling both reduced all pesticide levels.

81-0427. Anonymous **Statewide survey of synthetic organic compounds in water supply sources.** *Public Works* 111(12): 55-59; 1980.

Forty sets of samples were taken from wells beginning on June 4, 1979 in Delaware. The wells were ones which draw water from surficial or near surficial aquifers throughout the state. Analyses were conducted for synthetic organic compounds (SOC) and chlorinated pesticide organics (CPO) plus other contaminants. The wells included 28 public wells, 10 industrial wells and 7 groundwater monitoring wells. SOCs were found in both raw and finished water supplies from ground and surface water samples. No obvious correlation was noted between SOCs and concentrations of general water quality indicator parameters. CPOs were only identified for one well located in New Castle County which had previously been taken out of service. CPOs were suspected in 4 production wells and 2 groundwater monitoring wells due to the observed analytical peaks, although confirmation could not be obtained.

81-0428. Parris, G. E. (Div. Chem. Technol., Bur. Foods, US FDA, Washington, DC 20204) **Environmental and metabolic transformations of primary aromatic amines and related compounds.** *Residue Rev.* 76: 1-30; 1980 (139 references).

It is not always clear from the published reports what the role of microorganisms is in the environmental transformations observed for aromatic amines and related compounds. Some reactions are catalyzed by enzymes; but, in other cases, microorganisms only act to produce a local (intra- or extra-cellular) environment in which conditions are favorable for certain reactions. Classical organic chemists have explored many nonenzymatic reactions of nitrogen functional groups. This information should be a major source of inspiration and explanation for environmental scientists interested in the environmental fate of aromatic amines and related compounds. The high levels of aromatic amines used in most laboratory metabolism and fate studies prejudice the results seriously towards the formation of azobenzenes, bisaryl triazines, and bisaryls from combination of two aromatic amine moieties. At more reasonable environmental levels (sub-ppm) and in the presence of potential reaction partners such as humic matter, it is likely that such products will be of minor importance. The inter-conversion of amino groups and the related azo-, azoxy-, nitro-, nitroso-, and amide groups appears to occur more rapidly than mineralization reactions. Thus, these compounds can be regarded as latent forms of aromatic amines in the environment. (Author abstract by permission)

81-0429. Lichtenstein, E. P. (Dep. Entomol., Univ. Wisconsin, Madison, WI 53706) **Bound residues in soils and transfer of soil residues in crops.** *Residue Rev.* 76: 147-153; 1980 (8 references).

Since ^{14}C-labeled insecticides have become available, formerly unextractable, bound residues can be detected by combustion of the ^{14}C-containing material to $^{14}CO_2$. Although the nature of these bound residues is in most cases unknown, the concept of persistent and nonpersistent pesticides might have to be reconsidered. With NO_2-group-containing compounds such as parathion and methyl parathion, it was found that soil microorganisms reduce these insecticides in soil to amino-derivatives. These, in turn, become bound to soil and are considered unextractable. Thus, a steady decrease of extractable ^{14}C-parathion residues in soils over a 1 mo incubation period was accompanied by an increase of unextractable, bound ^{14}C-labeled residues, resulting finally in total recoveries of extracted plus bound residues of 80-87% of the applied radiocarbon. Once ^{14}C-residues had penetrated into animal or plant tissue, they were translocated and found partially in an unextractable, bound form or as benzene- and water-soluble ^{14}C-compounds. To study transfer of soil residues to crops, a sandy soil and a silt loam were treated with one of 6 insecticides of different water solubilities (0.001 to 320 ppm) and plants were grown in the soil. The amounts of ^{14}C-compounds were dependent upon the water solubility of the insecticide and the soil type. The total amount of ^{14}C recovered from soils plus plants was similar with DDT (water solubility 0.001 ppm) and carbofuran (water solubility 320 ppm). However, with DDT most of the insecticide remained in the soil while with carbofuran most of the recovered insecticide residues plus metabolites were associated with the greens. The amounts of ^{14}C bound to plant tissue as well as the amounts of detoxification products in plant tissue increased with increasing water solubilities of the insecticides. (Author abstract by permission, abridged) [Presented at the joint US-Taiwan Seminar, 1979]

81-0430. Calamari, D. (Ist. Ric. Acque, CNR, Rome, Italy) **Valutazione ecotossicologica di nuove sostanze chimiche; problemi scientifici ed attivita di organizzazioni nazionali ed internazionali. [Ecotoxicological evaluation of new chemical substances; scientific problems and activities of national and international organizations.]** *Riv. Ital. Sostanze Grasse* 57(6): 279-284; 1980 (32 references) (Italian).

The ecological and toxicological evaluation of chemical substances, including insecticides and herbicides, is discussed. Problems related to the chemical mobility and chemical and biological degradation of chemical substances are considered together with those regarding the hazard evaluation for the environment by means of ecotoxicological tests at different levels of complexity. The ecotoxicological evaluation of the new chemical substances is based on data on the no observed effect concentration, the estimated environmental concentration, quantitative structure-activity relationships, an integrated rating system and empirical application factors.

81-0431. Frank, R.; Braun, H. E.; Stonefield, K. I.; Elliott, J. M.; Zilkey, B. F. (Prov. Pestic. Residue Test. Lab., Min. Agric. & Food, Guelph, Ontario, Canada) **Insecticide residues and metal contents in flue-cured tobacco and tobacco soil of southern Ontario, 1976-1978.** *Tob. Int. (NY)* 182(23): 59-63; 1980 (7 references).

Insecticide residues were measured in samples of flue-cured tobacco collected from the sales floors of auction warehouses and from selected farms. Soil samples collected from the farms were also analyzed. Samples were collected from 1976 to 1978. A marked decline was noted in endosulfan residues, reflecting the removal of endosulfan from the list of recommended insecticides in 1975. Organophosphorus insecticide residues had practically disappeared from the leaves by the time the crop reached the auction floors. Use of dieldrin and DDT was banned in Ontario in 1969 and 1971, respectively. Soil residues were found to be declining slowly, indicating a half-life of 8-10 yr. Residues in tobacco leaves for the 3 yr of the study remained constant at 0.5 μg/g for ΣDDT and 0.02 μg/g for dieldrin. No buildup of endosulfan or organophosphorus insecticide residues in soil was observed.

81-0432. Tennankore, K.; Picot, J. J. C.; Chitrangad, B.; Kristmanson, D. D. (At. Energy Canada Ltd., Pinawa, Manitoba, Canada) **Aircraft vortex studies in forest aerial spraying.** *Trans. ASAE* 23(5): 1076-1079; 1980 (5 references).

Studies were made of trajectories of the vortices generated by an aircraft during forest aerial spraying of an insecticide. In the study, the forest ground sloped 3.4% down toward the north. Average tree height was 14 m and tree density was 1000 stems/acre. It was concluded that the wake vortex behind the Grumman TBM spray plane used had an important effect on the delivery of the insecticide. The descent rates of the initial vortex were higher than the steady state vortex descent rate calculated from the Rankine vortex model using elliptic wing loading. No evidence was found of vortex tube separation and no vortex instability breakup was noted. The descent rate of the vortex is apparently slowed by atmospheric turbulence, thus reducing its effectiveness in delivering spray to the trees.

81-0433. Prokopenko, V. A.; Filatova, G. A. (Azov Res. Inst. Fish., Azov, USSR) **Vliyanie karbofosa na gidrobiontov. [Effect of carbophos on hydrobionts.]** *Veterinariya (Moscow)* (9): 60-62; 1980 (Russian).

To develop guidelines of carbophos (malathion) applications to marshy forests, a water storage basin was sprayed with carbophos at 0.5 kg/ha. Carbophos was found to degrade readily; 95% degradation was achieved within 3.3-15.6 days. Analysis of the degree of accumulation in the fish showed the presence of carbophos residues in fish tissue for 7 days. Cholinesterase inhibition of 37-40% was recorded on days 1 and 7 after treatment with an increased dose of carbophos (0.9 kg/ha). There were no significant changes in the physiological or hematological parameters of the ichthyofauna.

81-0434. Baker, M. D.; Mayfield, C. I. (Dep. Biol., Univ. Waterloo, Waterloo, Ontario NL2 3G1, Canada) **Microbial and non-biological decomposition of chlorophenols and phenol in soil.** *Water Air Soil Pollut.* 13(4): 411-424; 1980 (32 references).

Studies on the aerobic and anaerobic degradation of phenol and selected chlorophenols were carried out using clay loam soil containing no added nutrients. The phenolic compounds were added to flasks containing soil to gave an initial concentration of 100 μg/g wet wt soil. For the aerobic experiments, flasks were sealed with a rubber serum cap (to prevent volatilization). For anaerobic tests, a hypodermic syringe needle connected to a vacuum pump and N_2 gas supply was inserted through the serum cap. At various intervals, soil samples were extracted with 95% ethanol and analyzed using a double-beam recording UV spectrophotometer. In other tests, the effects of some of the phenolic compounds on soil microorganisms were determined by a direct microscopic observation technique. Non-biological degradation was also studied in sterilized H_2O-washed silica sand. Results showed that under aerobic conditions, phenol, *o*-chlorophenol, *p*-chlorophenol, 2,4-dichlorophenol, 2,6-dichlorophenol, and 2,4,6-trichlorophenol were rapidly degraded, and *m*-chlorophenol, 3,4-dichlorophenol, 2,4,5-trichlorophenol, and pentachlorophenol (PCP) were very slowly degraded by microorganisms. Under anaerobic conditions, none of the compounds studied were degraded by microorganisms. The compounds appeared to stimulate microbial growth in the

soil. In sterile silica sand, phenol, *o*-chlorophenol, *m*-chlorophenol, *p*-chlorophenol, and 2,4-dichlorophenol underwent rapid non-biological degradation.

81-0435. Menzie, C. A. (EG&G Environ. Consult., Waltham, MA 02154) **Potential significance of insects in the removal of contaminants from aquatic systems.** *Water Air Soil Pollut.* 13(4): 473-479; 1980 (22 references).

The importance of insects in the removal of contaminants from sediments both within and outside of the aquatic system is considered. Through various models it is concluded that for moderate to high levels of insect population and for bioconcentration factors of 1000 or more, insects may play a very significant part in contaminant removal. Various parameters to a given situation must be considered in determining the value of the insects in this contamination removal. Production bioconcentration factors, time intervals and density of the sediments are all factors which would influence the relative importance of the insect population. The fate of contaminants once removed from the water or sediments by insects is also of concern. The contaminants may be released to water and sediments again, or they may enter terrestrial food webs and be biomagnified to higher trophic levels.

81-0436. Brown, L. (Dep. Environ. Sci., Plymouth Polytechn., Devon PL4 8AA, England) **The use of *Hydrobia jenkinsi* to detect intermittent toxic discharges to a river.** *Water Res.* 14(8): 941-947; 1980 (15 references).

River pollution in the Holme and its tributaries was monitoring during October 1975 to October 1977 using an *in situ* bioassay with the operculate gastropod *Hydrobia jenkinsi.* River samples artificially spiked with dieldrin or heavy metals were used in laboratory tests to assess survival rates of the gastropod in known concentrations of toxins. Close correlations were found between laboratory test responses and those recorded when *H. jenkinsi* was exposed to polluted river water samples. When caged *H. jenkinsi* were exposed *in situ* to water from pollutant discharge sites along the waterways, gastropod responses made it possible to detect when discharges were contaminated with certain heavy metals, especially copper and hexavalent chromium. *In situ* death was not attributed solely to dieldrin or heavy metals. At levels in excess of 30,000 ng/l, dieldrin failed to cause death of *H. jenkinsi* suggesting the need for an organism susceptible to pesticides as an indicator for river pollution by this organochlorine compound.

81-0437. Yamato, Y.; Suzuki, M. (Kitakyushu Munic. Inst. Environ. Health Sci., Kitakyushu, Japan) **Occurrence of herbicide oxadiazon in surface waters and tap water.** *Water Res.* 14(10): 1435-1438; 1980 (13 references).

The occurrence of oxadiazon in surface and tap water was studied using gas chromatographic analyses of water samples taken from 1 tap source, 5 Japanese rivers, and 1 Japanese reservoir. Positive identification of oxidiazon was confirmed by mass spectrometry. All samples, taken monthly from April to February, from the Tonda River site contained oxadiazon. The highest levels of the herbicide were found in the late summer for all sources, except in tap water where maximum levels of oxadiazon occurred in July. High levels of oxadiazon residue were found after the beginning of rice seedling transplantation at the Higashitani, Nishitani, and Murasaki River sites after which they rapidly decreased. Oxadiazon residues ranged from 0.001 to 1.953 ppb from all sources tested with levels in tap water ranging from about 3 to 23% of those in raw water.

81-0438. Effler, S. W.; Litten, S.; Field, S. D.; Tong-Ngork, T.; Hale, F.; Meyer, M.; Quirk, M. (Dep. Civil Eng., Syracuse Univ., Syracuse, NY 13210) **Whole lake responses to low level copper sulfate treatment.** *Water Res.* 14(10): 1489-1499; 1980 (49 references).

A time intensive monitoring program was used to assess the impact of three low level copper sulfate applications (455 kg $CuSO_4 5H_2O$ in a 10% solution) on Cazenovia Lake, New York. Parameters evaluated included filtered and total copper, type and number of phytoplankton, *in situ* assimilation of ^{14}C, bacterial numbers, enumeration and identification of zooplankton, the state of macrophyte nutrients, and filtered and reactive total phosphorus. Copper sulfate treatment caused only a slight increase in filtered copper levels as high as 5 μg/l over a 2-5 day period. No algicidal action resulted from the low level applications, however short term stress and changes in the natural seasonal succession within these populations were observed. No significant alterations occurred in the zooplankton, submerged macrophytes or levels of phosphorus in the water column as a result of the algicide applications. After each copper sulfate application, sharp decreases were noted in the water column bacteria, showing the direct negative impact of the treatment. After several days, recoveries in bacterial populations were observed. Phytoplankton populations reached normal levels within 1 wk after copper sulfate treatment.

81-0439. O'Connor, D. J.; Connolly, J. P. (Manhattan Coll., Bronx, NY 10471) **The effect of concentration of adsorbing solids on the partition coefficient.** *Water Res.* 14(10): 1517-1523; 1980 (21 references).

Laboratory studies demonstrate an inverse relationship between the concentration of adsorbing solids and the partition coefficient in natural water systems. The partition coefficient is defined as the ratio between the solid-phase and dissolved concentrations, and it is a function of the solubility of the adsorbate and of the organic and clay fractions of the adsorbent. Different compounds adsorbing

to the same solids have similar concentration dependences. For example, DDT, heptachlor and dieldrin adsorb to kaolinite, illite and montmorillonite, and cobalt and ruthenium adsorb to Lake Austin sediment at comparable slopes, or concentration dependences. This is also true for Dimilin (diflubenzuron) and Kepone (chlordecone) adsorbing to Range Point sediment and for heavy metals adsorbing to digested sludge. These relationships have numerous implications to the distribution and retention of heavy metals and organic chemicals in natural water systems.

81-0440. Nesbitt, H. J.; Watson, J. R. (Roche Maag Ltd., Banhstown, New South Wales 2200, Australia) **Degradation of the herbicide 2,4-D in river water. I. Description of study area and survey of rate determining factors.** *Water Res.* 14(12): 1683-1688; 1980 (21 references).

A study area for, and survey of, possible rate limiting factors which play a role in bacterial degradation of 2,4-D are discussed. The study area is the Avon River in Western Australia. The half-life of 2,4-D was related to several variables, mainly viable bacteria, nitrogen and phosphorous concentrations, sediment levels and chlorides. The degradation rate appeared to be closely related to nutrients and temperature, but nutrient concentrations were too low to draw firm conclusions.

81-0441. Nesbitt, H. J.; Watson, J. R. (Dep. Soil Sci. & Plant Nutr., Univ. W. Australia, Nedlands, Western Australia 6009, Australia) **Degradation of the herbicide 2,4-D in river water. II. The role of suspended sediment, nutrients and water temperature.** *Water Res.* 14(12): 1689-1694; 1980 (9 references).

Studies were performed to determine the effects of chemical and physical water parameters on the degradation rates of 2,4-D. 2,4-D was incubated in Avon River (Australia) water containing varying amounts of phosphorous and nitrogen, sediments, and at temperatures ranging from 6 to 25°C. In some experiments bacteria were also added. Increasing the concentrations of nutrients and sediments increased the rate of 2,4-D degradation. When nutrients were not added, adding bacteria (capable of degrading 2,4-D) did not increase the degradation rate. It appears that the rate of degradation is a function of nutrient conditions.

81-0442. Poku, J. A.; Zimdahl, R. L. (Dep. Agron., Univ. Missouri-Columbia, Columbia, MO 65211) **Soil persistence of dinitramine.** *Weed Sci.* 28(6): 650-654; 1980 (22 references).

The effects of soil temperature, moisture, and herbicide concentration on the rate of degradation of dinitramine (N^4,N^4-diethyl- α,α,α-trifluoro- 3,5-dinitrotoluene- 2,4-diamine) were measured in clay loam and sandy loam in the laboratory. In sandy loam, the rate of degradation increased with increasing temperature. In clay loam, the rate of degradation increased from 10 to 30°C and decreased at 40°C. Soil moisture content influenced the rate of degradation in the following order: 22 > 11 >> 2.2% (air dry) for clay loam and 12.0 = 6.0 >> 0.5% (air-dry) for sandy loam. First-order half-lives ranged from 3.2 at 30°C to 47 wk at 10°C in clay loam, and 2.3 at 40°C to 31 wk at 10°C in sandy loam. Applications in 2 yr did not cause buildup of dinitramine in the field. A mathematical model was used in an attempt to correlate laboratory and field data. (Author abstract by permission)

81-0443. Burnside, O. C.; Wicks, G. A. (Dep. Agron., Univ. Nebraska, Lincoln, NE 68583) **Atrazine carryover in soil in a reduced tillage crop production system.** *Weed Sci.* 28(6): 661-666; 1980 (25 references).

Atrazine [2-chloro-4-(ethylamino) -6-isopropylamino)-*s*-triazine] carryover under reduced or no-till row crop production systems was measured by planting oats (*Avena sativa* L.) the following year as a field bioassay during 1970 through 1976 at Lincoln and North Platte, NE. Oat yields indicate that soil persistence of normal-use rates of atrazine into the subsequent year is only a minor residue problem under reduced tillage cropping systems. Atrazine carryover in soil was less of a problem under these reduced tillage systems as compared with prior experiments with conventional tillage systems across Nebraska. (Author abstract by permission)

81-0444. Hiramatsu, R.; Furutani, F. (Yamaguchi-Ken Agric. Exp. Stn., Yamaguchi, Japan) **Persistence of sprayed captan and chlorothalonil on cucumber grown in greenhouse. Effect of fruit growth on reduction of concentration of pesticide residue.** *Yamaguchi-ken Nogyo* 31: 23-28; 1979 (3 references).

Pesticide persistence was studied in cucumbers grown in a greenhouse. Wettable powder formulations of captan or chlorothalonil was sprayed in May, 1975, and pesticide residues in the mature fruits were determined by gas chromatography using electron capture detection. Fruit samples were weighed and measured at every stage of development. The initial residue data were used to calculate initial deposits of pesticide on each fruit. Pesticide concentrations decreased rapidly (90% by 7-8 days); the residual amount of pesticide on each fruit correlated to the initial deposit on the fruit. It was concluded that the decrease in pesticide concentration was due to dilution by the growth of fruit, rather than to disappearance of the pesticide.

81-0445. Pestemer, W.; Mann, W. (Inst. Unkrautforsh., Biol. Bundesanst. Land. & Forstwirtsch., D-3300

Braunschweig, BRD) Rueckstandsituation von Herbiciedn in einigen Kuechenkraeutern. [Herbicide residues in some herbs.] *Z. Lebensm. Unters. Forsch.* 171(4): 272-277; 1980 (German).

The residue levels of 14 herbicides [alachlor, chloridazon, chlorpropham, chloroxuron, chlorthal-methyl (DCPA), desmetryn, lenacil, linuron, methabenz-thiazuron, monolinuron, napropamid, pendimethalin, phenmedipham, and terbutryne) in field-grown kitchen herbs (borage, dill, garden chervil, garden cress, anise, and sorrel) were determined at two laboratories. Borage plantations were treated with chlorpropham (8 kg/ha), linuron (1.5 kg/ha), napropamid (2 kg/ha), alachlor (5 kg/ha), chloridazon (3.5 kg/ha), desmetryne (1.3 kg/ha), chloroxuron (7 kg/ha) or lenacil (1.8 kg/ha). Most levels were below the maximum allowable residue levels, except for chlorpropham (0.06 mg/kg versus 0.05 mg/kg) alachlor (0.07 mg/kg versus 0.02 mg/kg) and lenacil (0.27 versus 0.10 mg/kg) in some cases. High chlorthal-methyl levels were found in dill (0.41 mg/kg versus 0.05 mg/kg). Terbutryne and chlorpropham residue levels exceeding the maximum allowable levels were found in garden chervil. A desmetryne level of 0.19 mg/kg (permissible level 0.02 mg/kg) was found in sorrel treated with a dose of 1.3 kg/ha. All residue levels were below the maximum allowable concentrations in garden cress and anise.

See also 81-0304, 81-0306, 81-0307, 81-0308, 81-0310, 81-0323, 81-0329, 81-0330, 81-0331, 81-0332, 81-0333, 81-0346, 81-0353, 81-0360, 81-0364, 81-0446, 81-0448, 81-0453, 81-0454, 81-0528, 81-0571, 81-0594 *and* 81-0597.

81-0446. Ware, G. W.; Estesen, B. J.: Buck, N. A. (Dep. Entomol., Univ. Arizona, Tucson, AZ 85721) **Dislodgable insecticide residues on cotton foliage: acephate, AC 222,705, EPN, fenvalerate, methomyl, methyl parathion, permethrin, and thiodicarb.** *Bull. Environ. Contam. Toxicol.* 25(4): 608-615; 1980 (2 references).

Studies were conducted to determine safe re-entry times for persons working in fields treated with insecticides. A series of pesticides were sprayed onto cotton plants, and samples of leaves were taken from 0-96 hr after spraying. Samples were extracted and analyzed by gas chromatography to determine residue levels remaining on leaves. From these data their persistence was determined. Three separate studies were performed. The pesticides used, in order of persistence, were AC 222,705 > permethrin > acephate > methomyl for experiment 1 (96 hr post application); thiodicarb > EPN > methyl parathion for experiment 2 (72 hr post application); and Pounce (a permethrin formulation) > fenvalerate > Ambush (a permethrin formulation) for experiment 3 (96 hr post application). After 72 hr, dislodgable residues ranged from 4.7 $\mu g/cm^2$ for thiodicarb to 0.03 $\mu g/cm^2$ for methomyl.

81-0447. Lewis, P. (Author address not given) **Controlling health hazards in the chemical industry.** *Chem. Ind. (London)* 21: 860-863; 1980 (7 references).

Work presently underway to safeguard occupational health and safety in the chemical industry is discussed. Much of this work is being performed by chemical firms and other companies directly related to hazardous occupations. The Chemical Industry Safety and Health Council (CISHEC) is making efforts to increase safety at these firms. Standards implementation and enforcement has progressed under the United Kingdom's Government Health and Safety Executive. Monographs published in this area deal with procedures for handling emergencies, safety audits, hazard and operability studies, processing plant hazards, building design, codes of practice and other areas of concern. Studies on acute health hazards included median lethality testing, investigations of problems involved in toxicity studies, medical problems occurring on the job, ingested poisons, labels for hazardous materials. Special efforts in the areas of epidemiology, worker health and safety, medical surveillance, and medical examinations are noted.

81-0448. Anonymous **Detoxifying chemicals: a new approach.** *Chem. Mark. Rep.* 218(16, pt 2): 7; 1980.

A report is presented concerning a genetic engineering technique for the development of microorganisms which can ingest and detoxify compounds such as 2,4-D and DDT. The technique involves isolating a microorganism that uses the toxic compound as a carbon source, then isolating the genes responsible for this activity and transferring them into a host bacterium which transmits the codes to the daughter cells. The technique has been successful for several other chlorinated hydrocarbons. It is suggested that the strains developed will be useful for the detoxification of harmful waste products.

81-0449. Fred, D.; Kessler, E. (Dep. Meteorol., Univ. Oklahoma, Norman, OK 73069) **Pesticide accidents in relation to weather conditions.** *Environ. Conserv.* 7(3): 219-222; 1980 (8 references).

Attempts were made to relate meteorological conditions within the lowest 500 meters to herbicide spray accidents during aerial application. May 10, 1977, was determined to be the day of that year on which the largest number of herbicide application accidents were reported. Weather conditions on that day included a relatively large pressure gradient, but only weak winds were recorded at an area 150 km distant from the accident sites. In attempts to find a significant relationship between herbicide accidents and pressure gradients, only a slight tendency was found for accidents to occur on days with larger gradients. It was concluded from the study that weather conditions are only one factor influencing herbicide accidents and that restrictive legislation based on meteorological criteria is not warranted at present.

81-0450. Maclure, K. M.; Macmahon, B. (Dep. Epidemiol., Sch. Public Health, Harvard Univ., Boston, MA 02115) **An epidemiologic perspective of environmental carcinogenesis.** *Epidemiol. Rev.* 2: 19-48; 1980 (281 references).

Present knowledge of the causal relationships existing between environmental contaminants and cancer development are reviewed. Problems in quantitation which are generic to many exposure-disease relationships are also discussed. Particular mention is made of epidemiologic evidence of carcinogenesis arising from exposure to phenoxyacetic acid and chlorophenol herbicides, which usually contain chlorinated dibenzodioxins as impurities. A cohort of railroad workers exposed to these chemicals revealed a higher cancer incidence rate than found in similar unexposed populations. Case reports of heavy exposure among patients who later presented with soft-tissue sarcomas are noted. Two case-control studies have confirmed the relationship between phenoxyacetic acid and chlorophenol spray exposure and the later development of soft-tissue sarcomas. Malignant lymphoma of the histiocytic type has also been linked to such exposures. Increased risk of lung and skin cancer for arsenical pesticide manufacturing workers and vineyard workers, respectively, has also been noted.

81-0451. Anonymous **EPA issues RPAR on captan.** *Farm Chem.* 143(10): 20; 1980.

The RPAR (rebuttable presumption against registration) on captan issued by the US EPA in August 1980 is discussed. Captan is the major fungicide used on apples to prevent apple scab. It is also used on almonds, grapes, peaches, nectarines and strawberries. As a seed dressing and for seedlings it is used to protect against rotting diseases of corn, sorghum, beans, cotton, peanuts, potato seed pieces and other field crops. Due to its rapid degradation in biological fluids or gastric contents, the manufacturers of the chemical maintain that captan is not mutagenic to people or animals. It has been found to cause mutations in bacteria under laboratory conditions. An increased incidence of duodenal tumors has been noted in mice fed high doses of captan over their entire lifespans. It is noted, however, that the maximum residue to which humans are exposed is < 0.003 mg/kg/day.

81-0452. Hopkins, J. (Author address not given) **Dioxin dangers to man.** *Food Cosmet. Toxicol.* 18(5): 541-546; 1980 (13 references).

Epidemiological aspects of dioxin toxicity to humans accidentally exposed to dioxin in Seveso, Italy and Coalite, England or to dioxin in 2,4,5-T in Sweden and Oregon are briefly reviewed. The spontaneous abortion index of women living in Alsea, Oregon was statistically significantly higher 2-3 mo after 2,4,5-T spraying of nearby forest areas. Dioxin contamination of 2,4,5-T is considered to the the likely causative factor. In Sweden, case-control studies of soft-tissue sarcomas indicated exposure to 2,4,5-T related phenoxy herbicides was associated with an almost six-fold increase in the risk of developing soft-tissue sarcoma. The effects of dioxin or dibenzofuran impurities in the herbicides were not separately assessed. In Seveso, extensive population studies have been, and are continuing to be, conducted on those exposed to dioxin after a trichlorophenol manufacturing plant explosion; residents of Seveso were evacuated from zone A but not from zone B. Chloracne incidence was 7% in zone A and 1.2% in zone B shortly after the accident, but declined over a 24-mo monitoring period. Monitoring of spontaneous abortions of zone A and zone B women indicate an increased rate in the latter part of 1976, but factors other than dioxin may be implicated in this observation. This monitoring program is still in progress. At the Coalite chemical plant a smaller survey of dioxin exposed individuals is being conducted. Results obtained so far indicate a significantly higher incidence of impaired liver function and related biochemical parameters.

81-0453. Mann, J. B.; Freal, J. J.; Enos, H. F.; Danauskas, J. X. (Chem. Epidemiol. Div., Dep. Epidemiol. & Public Health, Sch. Med. Univ. Miami, Miami, FL 33101) **Field application of evaluated methodology for determining 1,2-dibromoethane, EDB, in ambient air.** *J. Environ. Sci. Health B* 15(5): 529-543; 1980 (3 references).

Studies were performed to determine the levels of ethylene dibromide (EDB) to which workers in a citrus fumigation center and a warehouse were exposed. Samples of air in and around these facilities were taken and the danger areas were identified. EDB levels are given for various areas within the facilities. The values presented range from 1.0 to 622 ppb in a drum storage area. The proposed standard is 130 ppb in a 15 min exposure. A series of recommendations were made to alleviate the potential for excessive exposure, including modifications in operation of fumigation centers, test procedures for leaks in fumigation chambers, and the use of protective respirators.

81-0454. Egnatz, D. G.; Ott, M. G.; Townsend, J. C.; Olson, R. D.; Johns, D. B. (Dow Chem. Co., Midland, MI 48640) **DBCP and testicular effects in chemical workers: an epidemiological survey in Midland, Michigan.** *J. Occup. Med.* 22(11): 727-732; 1980 (15 references).

An epidemiologic survey was conducted in 1977 among workers with past potential exposure to the pesticide 1,2-dibromo-3-chloropropane (DBCP) to determine possible testicular effects. The study group consisted of 232 exposed workers and 97 controls (nonexposed workers). Each participant was given a physical exam, and measurements of semen samples, testicular size, serum follicle-stimulating hormone (FSH), luteinizing hormone (LH) and testosterone were taken. The employees were divided into groups based on type of work pattern, exposure intensity and time since last exposure. Frequency distributions indicate a tendency toward a higher percentages of low sperm counts, low testicular volume, high FSH and high LH levels among exposed employees, but only FSH and LH levels were found to be significantly different. Among employees directly exposed since 1972, greater duration of exposure correlated with lower sperm count, higher FSH level and smaller testicular volume. The findings were consistent with a reversible testicular effect of DBCP.

81-0455. Rogan, W. J. (Biometry Branch, NIEHS, Research Triangle Park, NC 27709) **The sources and routes of childhood chemical exposures.** *J. Pediatr.* 97(5): 861-865; 1980 (49 references).

Various aspects of poisoning in children are discussed. Children are exposed to a variety of toxic substances in the home. Poisons such as lead dust, asbestos fibers, chlordecone, PCBs, beryllium and dioxin have been transported into the home on the clothing of workers, who have contact with these substances. Industrial discharges are also modes of transmittal into the home. Endemic exposure to PCB, DDT, dieldrin and heptachlor can occur due to their tendency to bioaccumulated within the food chain. Epidemic poisonings from chemicals are illustrated by Love Canal, New York, and Seveso, Italy.

81-0456. Lehrbach, P. R. (Dep. Mol. Biol., Univ. Edinburgh, Edinburgh, Scotland) **Microbial degradation of xenobiotic compounds.** *Nature (London)* 288(5789): 322; 1980.

Techniques available for the microbial detoxification of xenobiotics before they are discharged to the environment are discussed. The breakdown of DDT anaerobically to *o*-dichlorophenylmethane by *Aerobacter aerogenes* is considered. The compound is then cometabolized by *Hydrogenomonas* to other less toxic chlorinated compounds. Parathion waste arising from liquid waste effluents and from industrial or domestic containers can be detoxified to *p*-nitrophenol in the presence of the enzyme hydroxylase.

81-0457. Palisano, P. (Author address not given) **1981-85 – These occupational health issues will be in the forefront.** *Occup. Hazards* 42(10): 79-82; 1980.

The proposed generic standard for occupational exposure to pesticides is discussed. It is estimated by OSHA that 34,000 workers are exposed to toxic substances during the manufacture and formulation of pesticides. Cancer-causing potentials of many of these compounds have been demonstrated in laboratory tests, including tests on dibromochloropropane (DBCP), ethylene dibromide, and 2,4,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD). Health effects on Kepone (chlordecone) factory workers and on workers exposed to DBCP are forefront in current thinking. A generic rather than a product-by-product approach to registration is suggested to provide better worker protection and easier compliance. Dioxins, and nitrosamines have been included on the list of substances requiring future study. TCDD has been labeled a carcinogen, and it is noted that workers involved in the manufacture of certain herbicides may be exposed to that substance.

81-0458. Cohen, R. C. (California Ind. Med. Clin. Inc., Santa Clara, CA) **Responding to toxic exposure emergencies.** *Occup. Health Saf.* 49(9): 35-37; 1980 (4 references).

The importance of quick and appropriate response to toxic exposure emergencies in an occupational setting is discussed. Logistical and organizational preparations, the need for knowledge of local hazards, and the designation and duties of a safety and health person (SHP) are considered. The sequence of events necessary to deal with an emergency are outlined. Emergency treatments of some major occupational toxic emergencies including acid/alkali burns, exposure to lung irritants, organophosphate and carbamate pesticide intoxication, and hydrocarbon narcosis are reviewed. Organophosphate and carbamate pesticides are acetylcholinesterase inhibitors; exposure can result in headache, blurred vision, weakness, tearing, salivation and constricted pupils. Immediate on-site action should include removal from exposure, decontamination and life support.

81-0459. Dore, M.; Langlais, B.; Legube, B. (Lab. Chim. XI, Trait. Eaux, U.E.R. Sci. Fondam. & Appl., Univ. Poitiers, F-86022 Poitiers, France) **Mechanism of the reaction of ozone with soluble aromatic pollutants.** *Ozone Sci. Eng.* 2(1): 39-54; 1980 (19 references).

The possible use of ozonation for the destruction of organic substances in drinking water was studied. Experiments were conducted on the ozonation of phenol, hydroquinone, aniline, acetophenone and MCPA. The study demonstrated that 2 steps occur in the reaction of these compounds with ozone. First, a relatively rapid phase is observed in which the aromatic ring is opened through hydroxylation. During this first step the ozone consumption is proportional to the concentration of the soluble aromatic pollutant. The second step is much slower, and probably consumes very little ozone.

81-0460. Huizenga, L. J. (Dutch Assoc. Rhinewaterworks, Rijncomm. Watrleidingoedrijven, RIWA, Amsterdam, The Netherlands) **The River Rhine as an example of international environmental policy in Europe.** *Water Ser.* 84(1015): 517-520; 1980.

An international commission was established in 1950 among the governments of The Netherlands, The Federal Republic of Germany, Luxembourg, France and Switzerland to protect the Rhine River and its catchment area from pollution. This commission serves as an advisory board to each of the member countries. Regulations passed by the commission must be enacted by the individual countries before the regulations can be enforced. In February, 1979, the Chemical Convention was passed by the commission. This convention stipulates that discharging of toxic chemical substances be terminated by the member countries. The first 16 compounds, selected on the basis of their toxicity, persistence and bioaccumulation, are mercury and its compounds, cadmium and its compounds, aldrin, dieldrin, endrin, chlordane, DDT and its degradation products, heptachlor and its epoxide, hexachlorobenzene, BHC isomers, endosulfan, PCP, PCBs, PCTs, hexachlorobutadiene and cancer-inducing substances. It is expected that the convention will eventually regulate the discharge of about 200 chemicals. The efforts of the Rhine River Commission and the European Community have resulted in considerable improvements in several Rhine River water quality parameters. Average mean daily values of the lower Rhine during 1979 were 0.00003 mg/l Cl for individual organochlorine pesticides and 0.0007 mg/l for cholinesterase inhibitors (as parathion equivalents).

81-0461. Moeller, F. (Bez. Hyg. Insp. & Inst. Potsdam, DDR-1500 Potsdam, DDR) **Zur Verantwortung der Hygieneorgane bie der Beseitigung von Giften, toxischen Abprodukten und Schadstoffen durch oberirdische Deponie. [Responsibilities of the hygiene authorities in connection with the ground-level disposal of poisons, toxic**

waste products and harmful substances.] *Z. Gesamte Hyg. Ihre Grenzegeb.* 25(12): 916-920; 1980 (46 references) (German).

The duties of state hygiene authorities involved in disposal of toxic wastes and related legal provisions are discussed. The environmental and hygienic problems of above-ground toxic waste dumps are considered. The toxic and hazardous wastes disposed of in above-ground waste dumps include PCB wastes. The evaluation of the environmental and hygienic impacts of toxic wastes is hindered by the lack of complex standards for certain toxic substances, such as BHC. Standards for the maximum allowable concentrations of BHC exist for food and air only.

See also 81-0330, 81-0331, 81-0350, 81-0381, 81-0397, 81-0464, 81-0497, 81-0514 81-0516 *and* 81-0594.

81-0462. Hall, J. G.; Pallister, P. D.; Clarren, S. K.; Beckwith, J. B.; Wigelsworth, F. W.; Fraser, F. C.; Cho, S.; Benke, P. J.; Reed, S. D. (Div. Med. Genet., Child. Orthoped. Hosp., Seattle, WA 98105) **Congenital hypothalmic hamartoblastoma, hypopituitarism, imperforate anus, and postaxial polydactyly – a new syndrome? Clinical, causal and pathogenic considerations.** *Am. J. Med. Genet.* 7(1): 47-74; 1980 (39 references).

Cases are described of six infants with a neonatally lethal malformation syndrome of hypothalamic hamartoblastoma, postaxial polydactyly, and imperforate anus. Some of the patients also showed laryngeal cleft, abnormal lung lobulation, renal agenesis and/or renal dysplasia, short fourth metacarpals, nail dysplasia, multiple buccal frenula, hypoadrenalism, microphallus, congenital heart defect, and intrauterine growth retardation. The clinical aspects of this previously undescribed syndrome are described in detail, and some possible causes are discussed. The mothers reported exposure to various drugs and toxic agents, but the only common exposures were alcohol, cigarettes, and insecticide exposure in three mothers (two during fumigation of homes and one exposed to Raid). One mother also reported exposure to herbicide Agent Orange (2,4-D and 2,4,5-T). It has thus far not been possible to determine the cause of this syndrome.

81-0463. Lerman, B. B.; Ali, B.; Green, D. (Hematol. Sect., Dep. Med., Northwest. Mem. Hosp., Chicago, IL 60611) **Megaloblastic, dyserythropoietic anemia following arsenic ingestion.** *Ann. Clin. Lab. Sci.* 10(6): 515-517; 1980 (7 references).

A 35-yr-old woman was hospitalized 20 hr after accidentally ingesting an arsenic-containing insecticide. Nausea, vomiting, abdominal cramping and diarrhea were presenting symptoms. During the first wk of hospitalization she developed respiratory failure, renal insufficiency, pulmonary edema, toxic hepatitis, malabsorption, encephalopathy and peripheral neuropathy. Blood tests revealed decreased iron stores with the marrow demonstrating striking dyserythropoiesis and megaloblastic features. She was treated with folate, iv fluids and antibiotics. On day 14 her bone marrow morphology demonstrated improvement in her condition. It is suggested that reticulocytopenia, megaloblastosis and karyorrhexis be viewed as signs of arsenic intoxication, and that repeated hematologic evaluations be made as an aid in assessing the prognosis for recovery.

81-0464. Morgan, D. P.; Stockdaly, E. M.; Roberts, R. J.; Walter, A. W. (Dep. Prev. Med. & Environ. Health, Coll. Med., Univ. Iowa, Iowa City, IA 52242) **Anemia associated with exposure to lindane.** *Arch. Environ. Health* 35(5): 307-310; 1980 (30 references).

A recent case of severe, but reversible, hypoplastic anemia was associated temporally with lindane exposure. A series of 46 cases of hematotoxicity associated with lindane is reviewed, and the weaknesses in the indictment of lindane as the causative agent are pointed out. A more rational policy for control of agents suspected of damaging bone marrow awaits improved understanding of pathogenetic mechanisms. (Author abstract by permission)

81-0465. Purshottam, T.; Kaveeshwar, U. (Biochem. Div., Def. Res. & Dev. Establ., Gwalior, India) **Effect of palmitic acid on regeneration of dichlorvos-inhibited plasma cholinesterase activity *in vitro*.** *Aviat. Space Environ. Med.* 51(10): 1134-1138; 1980 (21 references).

Male albino rats were kept for 1 mo on 4 types of diet: high protein diet (HPD), low protein diet (LPD), high fat diet (HFD) and standard diet (SD). Free fatty acids were significantly increased in those animals on the HFD. Albumin was significantly decreased in LPD rats. When animals were exposed to dichlorvos, the chemical proved more toxic to those animals which had been fed the HFD and LPD than those fed the HPD and SD. However, these results were not statistically significant. Dichlorvos-inhibited plasma cholinesterase spontaneously regenerated more quickly in HFD rats compared to the other groups. When palmitic acid was added to an *in vitro* plasma system the plasma cholinesterase activity was significantly regenerated in 2-24 hr.

81-0466. Akerman, K. E. O.; Jarvisalo, J. O. (Dep. Med. Chem., Univ. Helsinki, SF-00170 Helsinki 17, Finland) **Effects of ionophores and metabolic inhibitors on the mitochondrial membrane potential within isolated hepatocytes as measured with the safranine method.** *Biochem. J.* 192(1): 183-190; 1980 (35 references).

Hepatocytes isolated from male Wistar rats were used in studies on changes in the mitochondrial membrane potential within isolated hepatocytes under different conditions. The cells were incubated with KCN, valinomycin, oligomycin, duroquinone, FCCP and rotenone. Spectral changes of the cationic membrane potential probe, safranine, were determined. A slow reversal of the safranine signal was produced by rotenone in combination with oligomycin when both KF and iodoacetate were present. The signal was restored to the level produced by rotenone alone with the addition of duroquinone. It is suggested that the spectral response of safranine in the presence of isolated hepatocytes is a result of slow penetration of safranine into intracellular mitochondria.

81-0467. Cadenas, E.; Arad, I. D.; Fisher, A. B.; Boveris, A.; Chance, B. (Johnson Res. Found., Sch. Med., Univ. Pennsylvania, Philadelphia, PA 19104) **Hydroperoxide-induced chemiluminescence of the perfused lung.** *Biochem. J.* 192(1): 303-309; 1980 (35 references).

Hydroperoxide-induced chemiluminescence of the perfused rat lung and its enhancement by paraquat are described. Light emission was promoted by the infusion of t-butyl hydroperoxidase into the perfused lung at a rate of 125 μmol/min. Paraquat was administered to Sprague-Dawley rats at the ip dose of 50 mg/kg, and the chemiluminescence in the perfused lung was measured about 2 hr later. Lungs from the paraquat-injected rat showed 2-fold higher hydroperoxide-induced chemiluminescence yield than did the control. In a second experiment paraquat was infused into the perfused lung through the cannula situation in the inflow line to the pulmonary artery. The enhancing effect of paraquat was time-dependent. At higher doses the effect still relates to time rather than concentration, probably due to the active accumulation of the bipyridyl by the lung. It is concluded that the t-butyl hydroperoxide-induced chemiluminescence involves hydroperoxide-metabolizing systems other than catalase, as the latter enzyme does not react with tertiary hydroperoxides.

81-0468. Ohkawa, H.; Oshita, H.; Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Chem. Co. Ltd., 4-2-1 Takatsukasa, Takarazuka, Hyogo 665, Japan) **Comparison of inhibitory activity of various organophosphorus compounds against acetylcholinesterase and neurotoxic esterase of hens with respect to delayed neurotoxicity.** *Biochem. Pharmacol.* 29(20): 2721-2727; 1980 (21 references).

A variety of organophosphorus (OP) compounds with and without delayed neurotoxicity were examined for inhibitory power against neurotoxic esterase (NTE) and acetylcholinesterase (AChE) of hen brain *in vitro* and *in vivo*. Generally, delayed neurotoxicity induced by OP compounds correlated with high inhibition of NTE *in vivo*, wheras *in vitro* studies comparing I50s for both enzymes did not provide a guide to evaluation of delayed neurotoxicity. Single oral administration of delayed neurotoxic EPN, lepotophos and TOCP resulted in more than 80% inhibition of brain NTE at neurotoxic doses, whereas non-delayed neurotoxic methyl parathion, fenitrothion and cyanophos caused weak inhibiton at near lethal doses which gave rise to severe inhibition of brain AChE. A delayed neurotoxic dose of (−)-EPN caused more severe inhibition of brain NTE as compared with the same dose of the non-delayed neurotoxic (+)-isomer. However, a few compounds produced severe inhibition of NTE at non-delayed neurotoxic doses. Hens paralyzed by repeated administration of a low level of leptophos showed significant decreases in NTE activity of the brain and spinal cord. (Author abstract by permission)

81-0469. Laranjeira, M. C. M.; Armstrong, D. W.; Nome, F. (Dep. Quim., Univ. Fed. Santa Catarina, Florianopolis, SC, Brazil) **Reactions of vitamin B_{12} with polyhalogenated hydrocarbon pesticides.** *Bioorg. Chem.* 9(3): 313-317; 1980 (17 references).

Studies were conducted in the reactions of vitamin B_{12} with DDT, and its degradation products. Equal amounts of methylcobalamin (from which vitamin B_{12} is generated) and the test organic compounds were reacted. The resultant products were determined by gas chromatography. The results were dechlorination of DDT to form DDD (TDE) and DDE and small quantities of DDMS, DDMU, DDO and DDNU. Reactions of the vitamin with DDE resulted in DDMU and DDMS. Further tests demonstrated that DDE and DDMU do not react with vitamin B_{12}. It is suggested that vitamin B_{12} is in the pathway of pesticide dechlorination.

81-0470. Gawecki, J. (Inst. Hum. Nutr., Acad. Agric., PL-60623 Poznan, Poland) **Pestycydy a efektywnosc zywienia. [Pesticides and nutrition effectiveness.]** *Bromatol. Chem. Toksykol.* 12(2): 129-134; 1979 (77 references) (Polish).

Nutrition effectiveness depends on the quantity and the quality of food or feed consumption, food chemistry, food receptivity in digestion processes and adsorption in the alimentary canal. More and more frequently, residues of various chemical compounds, particularly pesticides, are found which can effect food or feed as well as consumers by disturbing the energy balance of people and animals. This is commonly observed by changes in body wt (growth inhibition). Nutrition effectiveness was evaluated in the three basic processes that pesticides can affect; food intake, digestion and absorption of high energy foods, and metabolism. Alimentary toxicity due to pesticides is reflected in a decrease of food intake. The fluctuation of indicative metabolites in the blood such as glucose, amino acids, and free fatty acids follows. Frequently pesticide toxicity accompanies hyperglycemia. Previous studies indicated the effects of pesticides on the stomach's ability to enlarge and to decrease, which affects food intake. Pesticide residues can inhibit cholinesterase, and in this way disturb the nervous system, which can cause an inhibition of food intake. Literature on the effect of pesticide residues in sub-acute and acute toxicity was reviewed. All studies indicate considerable changes in digestion and absorption. Pesticides disturb the mechanism of stomach operation and intestines. The majority of pesticides act as inhibitors of enzymatic catalysis; therefore, they can directly affect the digestive enzymes. Pesticides can cause increases or decreases in human and animal metabolism. It was proven that these changes are related to disturbances in the energy processes caused by changes in the activities of oxidation-reduction enzymes, by affecting physiological mechanisms, or by the regulation of metabolism. Pesticides also affect hormonal regulating mechanisms, including inhibition of biosynthesis of the thyroid gland hormones and induction of structural changes in this gland.

81-0471. Podolak, M.; Warchocki, B. (Dep. Chem. Injury, Inst. Occup. Med. & Hyg., Lublin, Poland) **Wplyw chlorfenwinfosu i karbarylu na fosforylacje oksydacyjna i procesy oddychania mitochondriow mogu szczura. [Effect of chlorfenvinphos and carbaryl on oxidative phosphorylation and respiration of brain mitochondria in rat.]** *Bromatol. Chem. Toksykol.* 12(2): 141-146; 1979 (16 references) (Polish).

In vitro experiments using rat brain mitochondria were carried out to determine effects of the pesticides chlorfenvinphos and carbaryl on cellular respiration. Polarographic measurements, using succinate as the substrate, were made of respiration rates, respiration check index, and energy yield of ATP synthesis. Chlorfenvinphos definitely affected respiration. A dose-dependent decrease of oxygen consumption in the stage 4 was observed, which indicated inhibition of the enzyme systems of the respiratory chain. Carbaryl was found to exert a similar, but weaker, effect on the mitochondrial metabolic processes.

81-0472. Podolak, M. (Dep. Basic Exam., Inst. Occup. Med. & Hyg., Lublin, Poland) **Wplyw parakwatu i kwasu 2,4-D na fosforylacje oksydacyjna i procesy oddychania mitochondriow mozgu szczura. [Effect of paraquat and 2,4-dichlorophenoxyacetic acid (2,4-D) on oxidative phosphorylation and respiration of brain mitochondria in rat.]** *Bromatol. Chem. Toksykol.* 12(2): 147-152; 1979 (20 references) (Polish).

Rat brain mitochondria were used to test the effects of paraquat and 2,4-D on cellular respiration. Oxygen consumption and the ADP consumption to oxygen consumption ratio were determined, as were the respiration process and oxidative phosphorylation. Uncoupling of oxidative phosphorylation was caused by paraquat at concentrations above 40 μM and by 2,4-D. However, paraquat in active animals caused oxygen consumption to be similar to that of controls. 2,4-D in active animals caused oxygen consumption to decrease.

81-0473. Szczepaniak, S.; Sienkiewicz, E. (Dep. Chem. Toxicol., Inst. Anal. & Techn. Pharm., Acad. Med., Lublin, Poland) **Wplyw ostrego zatrucia chlorfenwinfosem na poziom azotu aminowego i stezenia wolnych aminokwasow w erytrocytach krwi szczura. [Effect of acute intoxication with chlorfenvinphos on amino nitrogen level and free amino acids concentration in rat blood erythrocytes.]** *Bromatol. Chem. Toksykol.* 12(3): 267-272; 1979 (11 references) (Polish).

Male Wistar rats were used to elucidate the effects of chlorfenvinphos on erythrocyte amino nitrogen levels and free amino acid concentrations. Rats were given single oral dose of chlorfenvinphos corresponding to 0.5 the LD50. Amino nitrogen content was determined by the modified ninhydrin method and free amino acids were separated by paper chromatography prior to colorimetric and spectrophotometric determinations. Amino nitrogen and amino acid levels were determined at 2, 4, 24, 48, 72 and 120 hr after dosing. Significant decreases in amino nitrogen levels and free amino acid concentrations were observed after 2 hr. Maximum decreases were observed at 4 hr post-dosing.

81-0474. Lozowski, S. Z. (Dep. Hum. Physiol., Inst. Clin. Pathol., Med. Acad., Lublin, Poland) **Wplyw ostrego zatrucia szczurow chlorfenwinfosem na reaktywnosc skurczowa izolowanegp zolakda i jelita cienkiego wobec acetylocholiny. [Effect of acute intoxication of rats with chlorfenvinphos on contractive reactivity of isolated stomach and small intestine to acetylcholine.]** *Bromatol. Chem. Toksykol.* 12(3): 273-277; 1979 (20 references) (Polish).

The organophosphorus insecticide chlorfenvinphos was given as a single dose of 5 mg/kg by stomach tube to rats. Animals were sacrificed 2 hr after treatment and sections of stomach and jejunum prepared. Myographic recordings of the contractile activity were made. Motor function was measured at threshold concentrations of acetylcholine which included a 5 mm contraction. The sensitivities of stomach and jejunum muscles to acetylcholine were enhanced by chlorfenvinphos at 0.5 the LD50. This effect is explained by inhibition of the cholinesterase enzyme by the insecticide. Spontaneous contractions of the stomach and intestine muscles also increased.

81-0475. Tyburczyk, W.; Borkowska, J.; Choragiewicz, H.; Klimek, K. (Dep. Basic Exam., Inst. Occup. Med. & Hyg., Lublin, Poland) **Wplyw parakwatu na niektore wskazniki biochemiczne u szczurow. [Effect of paraquat on some biochemical indices in rat.]** *Bromatol. Chem. Toksykol.* 12(3): 283-288; 1979 (17 references) (Polish).

Male Wistar rats were used in experiments designed to elucidate some biochemical effects of paraquat. One group of animals was given a single ip dose of 0.1 or 0.5 the LD50, while a second group was given daily oral doses of paraquat (0.05 and 0.025 LD50) for 30 days. After sacrifice, blood was collected from the heart, and the brain and adrenals were removed. Blood calcium, phosphorous, lipid, hydroxyproline, cholesterol, free fatty acids, amine nitrogen, ascorbic acid, serotonin, and total protein levels, and cholinesterase activity were measured, along with organ catecholamines and serotonin levels, and acetylcholinesterase activities. Blood serotonin and brain noradrenalin levels increased and adrenal adrenaline levels decreased following a single ip doses of 0.1 the LD50 paraquat. Blood lipids and hydroxyproline levels increased and blood serotonin levels decreased following subacute intoxication with paraquat at 0.05 LD50. No effect levels were determined to be 0.05 the LD50 following single ad-

ministration and 0.025 the LD50 following subacute intoxication.

81-0476. Szczepaniak, S. (Dep. Toxicol. Chem., Inst. Anal. & Techn. Pharm., Acad. Med., Lublin, Poland) **Badania *in vitro* nad wiazaniem sie chlorfenwinfosu i jego metabolitow z wolnymi aminokwasami osocza i erytrocytow. [*In vitro* studies on binding of chlorfenvinphos and its metabolites with plasma and erythrocytes free amino acids.]** *Bromatol. Chem. Toksykol.* 12(4): 319-322; 1979 (8 references) (Polish).

Samples of rat serum and erythrocyte hemolysates were used in studies on the binding of chlorfenvinphos and its metabolites to blood amino acids. After incubation of the samples with the pesticide or its metabolites (monodesethylchlorfenvinphos, 2,4-dichloromandelic acid, and 2,4-dichlorophenacyl chloride) in a Warburg apparatus for 2 hr, amino acid concentrations were measured by paper chromatography and spectrophotometry. The extent of binding with amino acids was estimated from the difference in concentrations of the test and control samples. Results indicated that chlorfenvinphos was not bound by amino acids. All chlorfenvinphos metabolites blocked binding of the amino group of the amino acids. Binding to erythrocyte amino acids was increased over plasma amino acids.

81-0477. Latalski, M.; Halliop, J. (Indep. Lab. Electron Microsc., Inst. Biol. Morphol., Acad. Med., PL-20007 Lublin, Poland) **Obraz ultrastrukturalny komerek szeregu rozwomowego granulocytow obojetnochlonnych w zatruciu fosfamidonem. [Ultrastructural picture of neutrophilic granulocytes in their developmental stages following the intoxication with phosphamidon.]** *Bromatol. Chem. Toksykol.* 12(4): 323-332; 1979 (9 references) (Polish).

The possible effect of phosphamidon on the hematopoietic system in animals was studied. The ultrastructure of rat cell neutrophilic granulocytes during the developmental stages following acute and sub-acute toxicity with phosphamidon was observed. Studies of granulogenesis in these cells by using cytochemical reactions to differentiate the types of granules were evaluated. Disturbances in granulogenesis were more visible due to acute toxicity than to sub-acute toxicity. The quantitative reduction of secondary granules in myelocytes, metamyelocytes and mature granulocytes following both sub-acute and acute toxicity were found. In addition, in acute toxicity, primary granules devoid of myeloperoxidase, and swollen mitochondria sometimes with damaged sheath, and myelinic structures within membranes in all their developmental stages, were observed.

81-0478. Byczkowski, J. Z.; Tluczkiewicz, J. (Dep. Pharmacol., Acad. Med., Gdansk, Poland) **Mechanizmy dzialania DDT i DDE na mitochondria izolowane z kielkow zyta i pszenicy. [Mechanisms of DDT and DDE actions on mitochondria isolated from rye and wheat seedlings.]** *Bromatol. Chem. Toksykol.* 12(4): 345-349; 1979 (12 references) (Polish).

Isolated mitochondria from rye and wheat seedlings were used to study the effects of DDT and its derivative DDE. Both compounds inhibited the respiratory chain between NADH and CoQ, and caused the dissociation of oxidative phosphorylation. When the results were compared with those from studies on rat liver mitochondria, similar results were found. This suggests that DDT and DDE have the same mechanisms of action on corn and mammalian mitochondria.

81-0479. Fraczek, S. (Dep. Food Sci., Inst. Environ. Res. & Bioanal., Acad. Med., PL-90145 Lodz, Poland) **Badania toksycznosci dinokapu. Cz. V. Wstepne badania wplywu na reprodukcje. [Toxicity studies on dinocap. Part V. Preliminary studies on effects on the reproduction.]** *Bromatol. Chem. Toksykol.* 12(4); 351-356; 1979 (6 references) (Polish).

Three or four generations of rats were observed after being fed with 10% of the LD50 of dinocap. The gestation period of 21-22 days did not change in the various generations of rats. Large changes in appearance or behavior of these animals were not observed. Weakening, change in urine color and smaller increases of body wt were statistically negligible in the second generation, but were visibly and statistically important in the third and fourth generations. The feed intake in rats given dinocap was smaller. Indices characterizing fertility did not differ in particular groups or generations. However, dinocap had a negative effect on the survival rate and the rearing of the offspring. This was noticeable in the second generation but not observed in the third generation. These studies indicate there is a negative effect of dinocap on the various reproductive indices

81-0480. Minchew, C. D.; Hunsinger, R. N.; Giles, R. C. (Dep. Biol. Sci., Mississippi State Univ., Mississippi State, MS 39762) **Tissue distribution of mirex in adult crayfish *(Procambarus clarki).*** *Bull. Environ. Contam. Toxicol.* 24(4): 522-526; 1980 (3 references).

Adult American crayfish were used in studies designed to elucidate the mode of action of the delayed neurotoxicity of mirex by examining the tissue distribution of the labeled pesticide. Crayfish were exposed to ^{14}C-Ul-mirex in acetone at concentrations of 7.4 or 74 ppb. Half of the test animals were exposed until they exhibited the body-jerk response (early symptom), at which time they were removed for analysis. The remaining half were removed when they exhibited the legs-up response (late symptom). The brain, digestive gland, green glands, tail nerve cord, portion of tail muscle, and a section of intestine were

removed, homogenized, and analyzed by liquid scintillation counting. Among high-dosed animals, early symptoms occurred during the first 2-4 days and late symptoms between 7-14 days. Among low-dosed animals, early symptoms appeared at 4-7 days and late symptoms at 10-21 days. Neural involvement is suspected, since at the time of early symptoms the mirex level in neural tissues is very low, but increases dramatically by the time of late symptoms. The delayed neurotoxicity may be explained by the fact that initial concentrations of mirex in the intestine and hepatopancreas are high, indicating that they remove enough mirex from circulation to delay buildup in the neural tissues.

81-0481. Fingerman, S. W.; Russell, L. C. (Dep. Biol., Tulane Univ., New Orleans, LA 70118) **Effects of the polychlorinated biphenyl Aroclor 1242 on locomotor activity and on the neurotransmitters dopamine and norepinephrine in the brain of the gulf killifish, *Fundulus grandis*.** *Bull. Environ. Contam. Toxicol.* 25(2): 682-687; 1980 (18 references).

A study of the effects of the PCB Aroclor 1242 on neurotransmitters is presented. Included is a literature review of the effects of several pesticides on similar systems. In the brain of the killifish *Fundulus grandis*, norepinephrine (NE) levels decreased (controls = 2.5 μg/g, treated = 0.61 μg/g) when brain levels of Aroclor 1242 were 0.6 μg/g. The dopamine (DA) levels also decreased (controls = 0.91 μg/g, treated = 0.44 μg/g) when brain levels of Aroclor 1242 reached 0.4 μg/g. In other studies cited, dieldrin caused a depletion of both NE and DA in mallard ducks, but caused no changes in mice. Another investigation found that sublethal doses of methyl mercury decreased the levels of NE and DA in rats. DDT, however, caused a decrease of NE but no change in DA levels in rats. DDT and parathion both decreased NE and DA brain levels in goldfish. DDE and dieldrin reduced DA and NE levels in ring doves. It appears, therefore, that the effects of Aroclor 1242 are similar to those of several pesticides with respect to the action on the brain neurotransmitters dopamine and norepinephrine.

81-0482. Selypes, A.; Nagymajatenyi, L.; Berencsi, G. (Inst. Public Health & Epidemiol., Univ. Med. Sch., Szeged H-6720, Hungary) **Mutagenic and embryotoxic effects of paraquat and diquat.** *Bull. Environ. Contam. Toxicol.* 25(4): 513-517; 1980 (8 references).

Studies were performed in which the mutagenic and embryotoxic effects of paraquat and diquat were analyzed. Mice were administered diquat po (90 mg/kg) and by ip injection (either a single dose of 22 mg/kg, two 7.3 mg/kg doses, two 3.6 mg/kg doses, or five 0.73 mg/kg doses). Twenty-four hr after the single doses or the last of the multiple doses, bone marrow preparations were made. In another group of mice, gravid females 9 days post-conception were injected with paraquat (once with 8.0 mg/kg or four times with 2.0 mg/kg) or diquat (once with 11.0 mg/kg or four times with 2.7 mg/kg). Diquat caused asymptomatic chromatid gaps in 5-6% of all cells observed in the ip dosage group, and in 6% of the group that ingested the pesticide. Diquat caused the highest number of resorptions, 8/50 and 9/50 for the single and multiple doses, respectively. Paraquat caused 3/50 and 4/50 dead or resorbed embryos in the single and multiple dose groups, respectively. Several developmental abnormalities were observed (large fontanelles, wider cerebral sutures, flat dumbbell shaped ventral nuclei of the vertebrae) in the diquat treated embryos, but none related to paraquat treatment.

81-0483. Francis, B. M.; Hensen, L.; Metcalf, R.L. (Inst. Environ. Stud., Univ. Illinois, Urbana, IL 61801) **Response of Japanese quail *(Coturnix coturnix)* to organophosphorus ester-induced delayed neurotoxicity relative to domestic hens (*Gallus gallus* Domesticus).** *Bull. Environ. Contam. Toxicol.* 25(4): 537-540; 1980 (6 references).

Studies were performed to compare the organophosphorus ester-induced delayed neurotoxicity in quail and domestic hens. The birds were treated with 4 compounds, including the pesticide leptophos at 200-500 mg/kg. The hens showed ataxic paralysis from all compounds tested; none of the quail demonstrated this symptom. Some quail died from every dose level of leptophos, but no hens died at any level of any of the compounds tested. It is concluded that Japanese quail are unsuitable for screening of toxic substances due to the lack of any obvious locomotor disturbances.

81-0484. Burrell, R. E.; Corke, C. T. (Dep. Environ. Biol., Univ. Guelph, Guelph, Ontario N1G 2W1, Canada) **Interactions of the solvent acetone with the fungicides benomyl and captan in fungal assays.** *Bull. Environ. Contam. Toxicol.* 25(4): 554-561; 1980 (10 references).

The interference of acetone in fungal assays was studied. The effects of the solvent on fungal growth were determined by plating fungi on agar with 0.1 to 2% acetone. The interactions of the solvent with the fungicides captan (10 ppm) and benomyl (0.1 and 1.0 ppm) were determined by holding their concentrations constant while varying acetone concentrations over the range of 0.1 to 2.0%. The EC50 of acetone ranged from 0.88 to > 2.0%. The percent of inhibition due to the acetone when tested in conjunction with a fungicide varied considerably, from 3-97%. The response was either additive, antagonistic or synergistic, with the variation appearing to be a function of the fungus species tested.

81-0485. Hauch, R. G.; Norris, D. R.; Pierce, R. H. (Dep. Oceanogr. & Ocean Eng., Florida Inst. Technol.,

Melbourne, FL 32901) **Acute and chronic toxicity of sodium pentachlorophenate to the copepod, *Pseudodiaptomus coronatus*.** *Bull. Environ. Contam. Toxicol.* 25(4): 562-568; 1980 (19 references).

The toxicity of sodium pentachlorophenate (Na-PCP) to copepods was studied. Wild-caught copepods, *Pseudodiaptomus coronatus*, were cultivated in artificial seawater, and static bioassays were performed. Chronic toxicity, as alterations in the ingestion rate during the bioassay (determined by variation in fecal pellet formation), was measured. The 96-hr LC50 was 68.0 μg/l. Fecal pellet data indicated an increase in feeding rates (on algal cells) at high concentrations of pesticide. The pesticide, at concentrations less than 100 μg/l, can alter community structure at two levels. Decreases in primary producers and, the eventual death of the copepods, the secondary producers.

81-0486. Tipton, A. R.; Kendall, R. J.; Coyle, J. F.; Scanlon, P. F. (Dep. Fish. & Wildl., Virginia Polytech. Inst. & State Univ., Blacksburg, VA 24061) **A model of the impact of methyl parathion spraying on a quail population.** *Bull. Environ. Contam. Toxicol.* 25(4): 586-593; 1980 (36 references).

The impact of methyl parathion spraying on a quail population is modeled. Two 6×6 matrices indicate stages of brain AChE inhibition for two levels of spraying (1.13 kg/ha and 0.57 kg/ha), pesticide-induced mortality and natural mortality. Hypothetical populations of quail were subjected to simulations of 8 applications/wk. The model predicted greater pesticide mortality for the higher application rate. After 8 wk, 931 of the birds would die from methyl parathion at 1.13 kg/ha, and 637 would die in 8 wk at the 0.57 kg/ha rate. Information on pesticide responses can be synthesized into this model and it could be of value in management strategies for many wildlife species.

81-0487. Finlayson, B. J. (Water Pollut. Control Lab., Pestic. Invest. Unit, California Dep. Fish & Game, Sacramento, CA 95819) **Acute toxicities of the herbicide Komeen and Hydrothol-191 to golden shiner.** *Bull. Environ. Contam. Toxicol.* 25(4): 676-681; 1980 (14 references).

Studies were performed to determine the toxicity of the herbicides Komeen (copper-ethylenediamine complex; 8% copper equivalent) and Hydrothol-191 (endothall) to fish. Golden shiners were fasted for 48 hr, and acclimated to soft water for 2 wk or to hard water for 4 days prior to testing. Flow-through bioassays were conducted in 20 *l* plexiglass tanks. Komeen 96-hr LC50 values were 630 ppm in hard water and 67 ppm in soft water. Hydrothol-191 120-hr LC50 values were 0.32 ppm in hard water and 1.6 ppm in soft water. The use of these herbicides for effective *Hydrilla* control was discussed. It was concluded that of the 2 herbicides only Komeen can be used without extensive fish loss.

81-0488. Hoy, M. A.; Knop, N. F.; Joos, J. L. (Dep. Entomol., Univ. California, Berkeley, CA) **Pyrethroid resistance persists in spider mite predator.** *Calif. Agric.* 34(11-12): 11-12; 1980.

Spider mite predator, *Metaseiulus occidentalis*, populations were studied to determine the mechanisms involved in developing pyrethroid resistance. The study indicated that permethrin resistance is inherited as a polygenic character, resulting from cumulative action of multiple sets of independently transmitted genes, each producing only a small effect. Field trials of the effectiveness of a permethrin-resistant spider mite predator strain are to be performed during the 1980-81 growing season in California almond and apple orchards and in Washington apple and Oregon pear orchards. It is suggested that strains of *M. occidentalis* can be developed which are resistant to organophosphorus, carbamate and pyrethroid insecticides.

81-0489. Batt, B. D. J.; Black, J. A.; Cowan, W. F. (Delta Waterfowl Res. Stn., Portage la Prarie, Manitoba R1N 3A1, Canada) **The effects of glyphosate herbicide on chicken egg hatchability.** *Can. J. Zool.* 58(10): 1940-1942; 1980 (4 references).

Hatchability and time to hatch of chicken eggs were found to be unaffected by application of glyphosate herbicide at 3 different concentrations and at 4 different embryo ages. We concluded that the use of the chemical as a weed control agent in zero tillage farming should not negatively affect the hatchability of the eggs of upland nesting birds. (Author abstract by permission)

81-0490. Nachtomi, E. (Inst. Anim. Sci., Agric. Res. Organ., Volcani Cent., Bet Dagan, Israel) **Modulation of the mitotic action of ethylene dibromide.** *Chem. Biol. Interact.* 32(3): 311-319; 1980 (28 references).

Studies were performed to determine the effects of ethylene dibromide (EDB) on mitosis in rat liver. A series of 5 studies were performed in which single doses and multiple doses of EDB alone or in addition to other compounds were administered. EDB-induced liver DNA synthesis peaked after 48 hr in fasted rats and after 24 hr in refed rats. Cell necrosis resulted from fasting enhancement of single large EDB doses. Multiple, low level doses also increased DNA synthesis as well as the activity of several serum enzymes. The action of EDB could be decreased by treatment with phenobarbitone or increased by diethyldithiocarbamate.

81-0491. Baltazar, R. F.; Mower, M. M.; Reider, R.; Funk, M.; Salomon, J. (Div. Cardiol., Sinai Hosp., Baltimore, MD 21215) **Acute fluoride poisoning leading to fatal hyperkalemia.** *Chest* 78(4): 660-663; 1980 (7 references).

A 25-yr-old, black male was admitted after rat poison ingestion 2.5 hr prior to admission. The poison contained sodium flouride. At about 1 hr after admission, ventricular fibrillation developed. Initial defibrillation succeeded, however, they recurred in spite of iv lidocaine and repeated defibrillation. Autopsy revealed severe congestion of lungs and liver, mild left ventricular hypertrophy, and normal coronary arteries. Marked hyperemia of the serosa of both stomach and esophagus was observed and the mucosa of the stomach was markedly congested. The lumen contained 50 ml of purplish brown fluid. Stomach contents included the originally ingested powder which contained a high concentration of fluoride ions. It is suggested that all patients with acute sodium fluoride poisoning be continuously monitored by electrocardiography.

81-0492. Mitchell, S. C. (Dep. Biochem., Univ. Birmingham, Edgbaston, Birmingham B15 2TT, England) **Comparative metabolism of phenothiazine in the rat *(Rattus norvegicus)*, mouse *(Mus musculus)*, hamster *(Mesocricetus auratus)* and gerbil *(Gerbillus gerbillus).*** *Comp. Biochem. Physiol. C* 67(2): 199-202; 1980 (33 references).

The urinary metabolites of phenothiazine have been identified and quantitated for the rat, mouse, hamster and gerbil. All species excreted the majority of the compound in conjugated form. The rat, mouse and gerbil were similar in producing leucophenothiazone sulfate as their major metabolite, relying more on the C-oxidation pathways than the hamster which excreted large amounts of phenothiazine-*N*-glucuronide. In all species the 24 hr urinary recovery was low (18-44%). These results are discussed in comparison to previous metabolic studies on this compound in other species. (Author abstract by permission)

81-0493. Fox, G. A.; Donald, T. (Wildl. Toxicol. Div., Canadian Wildl. Serv., Natl. Wildl. Res. Cent., Dep. Environ., Ottawa, Ontario K1A 0E7, Canada) **Organochlorine pollutants, nest-defense behavior and reproduction success in merlins.** *Condor* 82(1): 81-84; 1980 (18 references).

The behavior of nesting merlins (*Falco columbarius*) was investigated and possible relationships to organochlorine contamination were considered. In only 3 of 12 comparisons were behavioral responses significantly altered in birds which were contaminated when compared to uncontaminated controls. However, there were significant differences in egg shell quality and in reproductive performance. Both groups of birds attacked human intruders. However, the attack was less belligerent among the contaminated birds. It has been assumed that many females who abandon nest sites prior to egg-laying are heavily contaminated with organochlorines; however, this relationship cannot be established from these field studies. It is suggested that the most aberrant individuals in the bird populations may not have been observed during this study.

81-0494. Vanhee, J.; Ceuterick, A.; Dooms, M.; Dooms-Goossens, A. (Dep. Dermatol., Univ. Hosp., Kathol. Univ. Leuven, B-3000 Leuven, Belgium) **Etisazole: an animal antifungal agent with skin sensitizing properties in man.** *Contact Dermatitis* 6(6): 443; 1980 (1 reference).

A patient presented with a case of acute contact dermatitis apparently caused by allergy to Ectimar (10% etisazole), a local antimycotic veterinary ointment. Ectimar had been applied to treat an itchy patch on the wrist. After the condition had cleared patch tests revealed sensitization toward paraphenylenediamine and benzocaine. It is suggested that a metabolite of Ectimar was the cause of the dermatitis.

81-0495. Schaich, K. M. (Med. Dep., Brookhaven Natl. Lab., Upton, NY) **Free radical initiation in proteins and amino acids by ionizing and ultraviolet radiations and lipid oxidation. Part III: free radical transfer from oxidizing lipids.** *CRC Crit. Rev. Food Sci. Nutr.* 13(3): 189-244; 1980 (362 references).

The generation of free radicals in proteins by oxidizing lipids is reviewed. The basic principles of oxidizing lipids are detailed and compared with UV and ionizing radiation. Interactions with other free radicals are described. For example, the hydroxyl radical is produced by O_2^- in the oxidation of the herbicide paraquat. Previously it was thought that the radical was $^1O_2$, but recent evidence on the superoxide anion self-disproportionation has confirmed that in the case of paraquat the product is the OH radical. A detailed review of enzymatic and non-enzymatic oxidation-reduction reactions is also given, followed by a review of the various aspects of protein and oxidizing lipid interactions.

81-0496. Tayyaba, K.; Hasan, M. (Brain Res. Cent., Jawaharlal Nehru Med. Coll., Aligarh Muslim Univ., Aligarh 202001, India) **Organophosphate insecticide DDVP-induced increment in regional total lipids and cholesterol levels: diminution of phospholipid concentration in different regions of the rat brain.** *Curr. Sci.* 49(16): 617-619; 1980 (16 references).

The effects of the organophosphorus pesticide dichlorvos (DDVP) on regional brain lipid concentration was studied in rats. Animals were given ip doses of 3 mg dichlorvos/kg body wt daily for 15 days. Rats were then

decapitated and cerebrum, cerebellum and brain stem dissected out separately. Lipids were extracted, and histochemical studies were carried out. Increased total lipid and cholesterol and decreased phospholipid levels were found all areas of the brain. These findings are supported by the histochemical results, which showed sudanophilic lipid deposits and mild deposits of phospholipid.

81-0497. Karam, J. H.; Lewitt, P. A.; Young, C. W.; Nowlain, R. E.; Frankel, B. J.; Fujiya, H.; Freedman, Z. R.; Grodsky, G. M. (Metab. Res. Unit, Univ. California, San Fransicso, CA 94143) **Insulinopenic diabetes after rodenticide (Vacor) ingestion.** *Diabetes* 29(12): 971-977; 1980 (5 references).

Several case reports are presented in which persons ingested the rodenticide Vacor (pyriminil). The poison induced insulinopenic diabetes in those that survived. The absence of glucagon level reduction indicated a beta-cytotoxic effect. Extensive beta cell destruction was observed in autopsied persons who died as a result of Vacor ingestion. Toxic effects in rats precluded *in vivo* studies, but tests on isolated islet cells indicated a direct inhibitory effect. This effect was prevented by the addition of nicotinamide, which appears to act in a manner similar to streptozotocin.

81-0498. Maly, M. P. (Northeastern Univ., Boston, MA 02115) **A study of the effects of pesticides on single and mixed species cultures of algae.** *Diss. Abstr. Int. B* 41(4): 1227; 1980.

This study reports the effects of pesticides on five axenized saltmarsh phytoplankters, *Nitzschia closterium*, *Amphora coeffeaeformis* v. *borealis*, *Chlorococcum* sp., *Amphiprora* sp., and *Gonyaulax* sp. First, the effect of two carbamates, Baygon (propoxur) and Sevin (carbaryl), and three organophosphates, Abate (temephos), Dursban (chlorpyrifos), and malathion, at 10 ppm on the growth of single-species cultures is discussed. The two carbamates are more toxic to the species tested than are the three organophosphates. Second, the possible effect of seasonality is investigated by comparing the growth of unialgal cultures with varying concentrations of the most toxic pesticide, Sevin, at two temperature regimens. Two of the species, *Nitzschia* and *Amphora*, are inhibited to a greater degree at 20°C, the temperature further from the optimum. *Gonyaulax* was inhibited at neither temperature. Results with the other two species are inconclusive. Third, the effect of biotic interactions on the toxicity of Sevin is studied in communities of varying numbers of species. Biotic factors interact with Sevin in multispecies communities: the order of sensitivity in the multispecies cultures is not the same as in unialgal cultures. Rather, toxicity is roughly inversely related to the rate of increase of numbers (r) in single species cultures. Two of the species which are inhibited by Sevin in single species cultures, *Nitzchia* and *Chlorococcum*, increase in multispecies cultures when compared to control as a result of decreased competition in the pesticide treated cultures. Community structure and function, diversity, productivity, and biomass change as a result of addition of pesticides. The degree of change is not directly related to diversity, but is affected by the species composition. The change in species composition is greatest when a major member of the community is most inhibited by the treatment. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8023642)

81-0499. Gagne, C. C. (Texas A&M Univ., College Station, TX) **Insecticide synergism by chlordimeform: nature and mechanism(s) of action.** *Diss. Abstr. Int. B* 41(5): 1638-1639; 1980.

The nature of insecticide synergism by chlordimeform (CDF) was studied with emphasis on the biochemical mechanism by which this interaction could be achieved. Three enzyme systems commonly involved in the detoxification of insecticides were tested in two insects for inhibition by CDF. Two experiments were designed to provide evidence on the mode of action of CDF. Two of the 3 enzyme systems were affected by CDF. CDF proved to be an inhibitor of parathion metabolism by microsomes from house flies. Glutathione dependent transferases were inhibited 50% by 3×10^{-4} *M* CDF. The ali-esterases showed no indication of inhibition by 10^{-2} *M* CDF. Cross resistance was greatest in 2 house fly strains which have high levels of microsomal oxidase activity possibly because of increased detoxification of CDF. In fly strains with other mechanisms of resistance, such as decreased penetration or target changes, there was no cross resistance to CDF. Studies of CDF as an AChE inhibitor indicate that CDF is a weak inhibitor, about 1000 times weaker than the organophosphate, trichlorfon. CDF showed characteristics of a competitive inhibitor, and apparently can bind reversibly to AChE. This study provides a limited amount of evidence that a target site interaction should be considered as a possible additional mechanism for synergism by CDF. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8023028)

81-0500. Khan, H. M. (Univ. Minnesota, Minneapolis, MN) **Avian eggshell thinning, DDT, DDE and the role of mitochondria.** *Diss. Abstr. Int. B* 41(5): 1640; 1980.

Interspecific and intertissue differences were found in the *in vitro* sensitivity of O. S. ATPases from avian tissue homogenates to DDE. The enzyme preparation from the target tissue, the shellgland, of kestrels and mallards, which lay thin-shelled eggs on exposure to DDE, showed significantly greater sensitivity to DDE than that from non-target tissues (muscle, brain) as well as chicken shellgland. DDT, in contrast to DDE, was uniformly effective on O. S.

ATPase. The inhibition of Na^+,K^+-ATPase in brain mitochondrial preparation was insignificant. The O. Ins. ATPase inhibition was observed only in the muscle mitochondrial preparation but was less than that of O. S. ATPase. The inhibition by DDT and DDE of mitochondrial and microsomal Ca^{2+}-ATPase from kestrel shellgland was poorer than that associated with chicken shellgland mitochondria. The sensitivity of these enzymes was extremely poor as compared with the O. S. ATPases. In mitochondrial preparations from cockroach coxal muscle, DDT and DDE, inhibited both the electron transport and the oxidative phosphorylation. DDT was a stronger inhibitor than DDE and totally abolished the electron transport, and consequently the oxidative phosphorylation and Ca^{2+}-stimulated respiration, at higher concentrations. Aroclor 1242 and 1254 were found to be uncouplers of oxidative phosphorylation. The selectivity of DDE action in the eggshell thinning sensitive birds is proposed to be due to its action on shell-gland O. S. ATPases, the reduction in ATP synthesis affecting energy-linked calcium transport. The need for *in vivo* studies including mitochondrial calcium transport is emphasized. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 8025466)

81-0501. Salleh, Y. B. (Univ. Florida, Gainesville, FL) **Control of *Anticarsia gemmatalis* Hubner with recommended and experimental chemical and microbial pesticides and their effects on predatory species in soybean agroecosystem.** *Diss. Abstr. Int. B* 41(5): 1642-1643; 1980.

Nine chemical pesticides, a commercial preparation of *Bacillus thuringiensis* Berliner (BT; Dipel) and a nuclear polyhedrosis virus (NPV) isolated from velvetbean caterpillar (VBC), *Anticarsia gemmatalis* Hubner, were used at their recommended rates to control VBC on soybean. The chemical pesticides included acephate, diflubenzuron, carbaryl, fentin hydroxide, methyl parathion, methomyl, permethrin, toxaphene, and an experimental carbamate UC51762. Mixtures of diflubenzuron with BT, carbaryl, and virus; and carbaryl with BT were also used. Results indicated that methyl parathion was the most toxic to nabids, geocorids, and spiders. Toxaphene was toxic to nabids, geocorids, and spiders. Toxaphene also increased activity of *Calosoma* spp. and *Labidura* spp., which resulted in higher catches after the first 2 wk following treatment. However, there were indications that toxaphene reduced *Calosoma* and *Harpalus* populations up to 2 wk following treatment. Diflubenzurion, carbaryl, BT, fentin hydroxide, and UC51762 allowed excellent survival of nabids. Acephate, methomyl and permethrin were toxic to nabids although less so than methyl parathion. Virus reduced nabid numbers, but significant reductions were observed only twice. Acephate, methomyl, permethrin, and UC51762 seemed to be toxic to spiders, even though reductions in their numbers were not always significant. Acephate reduced the geocorid populations which survived all other treatments except methyl parathion and toxaphene. In general, the more toxic compounds to these predator species were methyl parathion, toxaphene, acephate, methomyl, and permethrin. Diflubenzuron, carbaryl, UC51762, fentin hydroxide, BT and virus exhibited reduced toxicity for these predators. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8025395)

81-0502. Mayes, B. A. (Albany Med. Coll., Union Univ., Albany, NY) **The role of hepatic nuclear ploidy in halogenated hydrocarbon-induced tumorigenesis in mice and rats.** *Diss. Abstr. Int. B* 41(5): 1666-1667; 1980.

Alterations in hepatic nuclear volumes and frequencies were studied in male mice (CD-1 and $B_6C_3F_1$) and rats (Sprague-Dawley) after exposure to tumorigenic xenobiotic compounds including mirex, dieldrin, CCl_4, and PCB. Measurements of hepatic nuclear volumes and frequencies on an electronic particle counter, revealed that polyploid nuclei (tetraploid and octaploid) were selectively altered in volume and frequency, while diploid nuclei were unchanged. The hepatic nuclear changes were more extensive in mice than in rats, indicating that mice are more susceptible to these compounds than rats. Comparison of the two strains of mice further revealed that the $B_6C_3F_1$ hybrid strain was more susceptible than the CD-1 strain to xenobiotic induced hepatic nuclear change. Histopathologic, enzymatic, and autoradiographic differences between diploid and polyploid heterocytes were also determined. In the mice and rats exposed to xenobiotic compounds, the polyploid hepatocytes became hypertrophic, had decreased G-6-Pase enzyme activity and were markedly more active at DNA synthesis, as revealed by [^{3}H]-thymidine incorporation, than diploid hepatocytes. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 8024520)

81-0503. Curtis, L. R. (Med. Cent., Univ. Mississippi, Jackson, MS) **Hepatic dysfunction produced by mirex, photomirex and chlordecone and their interactions with carbon tetrachloride.** *Diss. Abstr. Int. B* 41(5): 1733; 1980.

The organochlorine analogs mirex, photomirex and chlordecone are known hepatotoxins which affect diverse aspects of hepatic function. Changes in hepatic biochemistry and function were demonstrated in male Sprague-Dawley rats after 15 day dietary exposures to these agents. The three chlorocarbon compounds were compared for their potential to interact with CCl_4 to produce greatly potentiated hepatotoxicity. Further, the disposition of these analogs was compared using gas chromatography and radioassay techniques after unlabeled and ^{14}C-labeled compounds were administered. Hepatobiliary dysfunction induced by the three chlorocarbon compounds and possible relationship to hepatocelilular energetics was examined. Potentiation of haloalkane toxicity as a result of interaction with environmental pollutants is an environmental

concern because of the potential for co-exposure. Profound potentiation of carbon tetrachloride (CCl_4) hepatotoxicity resulted from 10 ppm chlordecone, but not from mirex or photomirex pretreatment at 10 ppm. The extent of potentiated CCl_4 hepatotoxicity did not correlate with estimates of hepatic microsomal mixed function oxidase induction by chlordecone, mirex, or photomirex. Octanol:water partition coefficients for the three chlorocarbons were found to correlate well with *in vivo* parameters of disposition such as liver to bile concentration ratios. Chlordecone reached highest concentrations in the liver whereas mirex and photomirex accumulated preferentially in fat. The hepatic subcellular distribution of these organochlorines was not markedly different. Despite the close structural similarity, chlordecone, mirex and photomirex differ significantly in octanol:water partition coefficient, sequestration in liver and fat and potentiation of CCl_4 hepatotoxicity, while other biochemical and hepatic functional parameters changed in accordance with their structural similarity. (Author abstract by permission, abridged. Copies of the thesis available from University Microfilms, order No. 8024611)

81-0504. Bansal, S. K.; Verma, S. R.; Gupta, A. K.; Dalela, R. C. (Pollut. Relevant Res. Lab., Postgrad. Dep. Zool., D.A.V. Coll., Muzaffarnagar 251001, India) **Predicting long-term toxicity by subacute screening of pesticides with larvae and early juveniles of four species of freshwater major carp.** *Ecotoxicol. Environ. Saf.* 4(3): 224-231; 1980 (22 references).

Studies were designed to determine the 96 hr TL50 values for chlordane, methyl demeton and carbaryl, along with the no-effect levels, in larval carp (*Labeo rohita, Cirrhina mrigala, Catla catla,* and *Cyprinus carpio*). Larvae of each species were exposed to 10 different concentrations of each pesticide for 30 days. The 96 hr TL50 values were calculated from the mortality during the first 4 days of exposure. The 96 hr TL50 values (in mg/l) ranged from 0.012 to 0.020 for chlordane, 1.24 to 1.60 for methyl demeton, and 1.42 to 2.00 for carbaryl. The maximum acceptable toxicant concentration (MATC) values ranged from 0.42 to 0.50 μg/l for carbaryl. These 96 hr TL50 and MATC values were used to determine application factors for each pesticide and each species. These factors can be utilized for setting water quality standards.

81-0505. Hooftman, R. N.; Vink, G. J. (Maatsch. Technol., TNO, NL-2600 AE Delft, The Netherlands) **The determination of toxic effects of pollutants with the marine polychaete worm *Ophryotrocha diadema*.** *Ecotoxicol. Environ. Saf.* 4(3): 252-262; 1980 (21 references).

Studies on the toxicity of various pollutants to a polychaete worm are presented. Two to 3-day old larvae of *Ophryotrocha diadema* were subjected to various levels of pollutants. Short-term tests provided 96 hr LC50 values, and long-term tests resulted in data on reproductive effects. Long-term reproduction studies were also conducted. The 96 hr LC50 for PCP was 0.6 mg/l for larvae and 1.2 mg/l for adults. Dieldrin resulted in LC50 values of < 0.1 mg/l for both adults and larvae. The 3,4-dichloroaniline (DCA) 96 hr LC50 was 4 and 15 mg/l for larvae and adults, respectively. In long-term studies on PCP-exposed larvae, no reproduction occurred at 0.335 ppm. When experiments were started with adults, reproduction occurred at 0.335 ppm, but at a greatly reduced level.

81-0506. Nehez, M.; Paldy, A.; Selypes, A.; Korosfalvi, M.; Lorinczi, I.; Berencsi, G. (Inst. Hyg. & Epidemiol., Univ. Med., Szeged, Hungary) **The mutagenic effect of trifluralin-containing herbicide on mouse germ cells *in vivo*.** *Ecotoxicol. Environ. Saf.* 4(3): 263-266; 1980 (8 references).

In vivo tests were carried out using mouse germ cells to study the mutagenic effects of the herbicide, Olitref (26% trifluralin). Male mice were treated ip with a single dose of 0.20 g/kg Olitref (0.33 LD50). Spermatocyte chromosome examinations, dominant lethality tests, and F_1-embryonic chromosome examinations were carried out. The herbicide was mutagenic in all 3 tests, and caused damage in every phase of spermatogenesis. Treatment with 0.006 g/kg of Olitref (0.01 LD50) was also mutagenic in the spermatocyte examination.

81-0507. Singh, H.; Singh, T. P. (Dep. Zool., Fish Endocrinol. Lab., Banaras Hindu Univ., Varanasi 221005, India) **Effect of two pesticides on total lipid and cholesterol contents of ovary, liver and blood serum during different phases of the annual reproductive cycle in the freshwater teleost *Heteropneustes fossilis* (Bloch).** *Environ. Pollut.* 23(1): 9-17; 1980 (27 references).

Studies were conducted which demonstrated the effects of Cythion (malathion) and Hexadrin (endrin) on lipid and cholesterol levels in freshwater catfish during the reproductive cycle. Adult female fish were collected during various reproductive stages and acclimated to laboratory conditions. Two levels of pesticides were used, safe and sublethal (9 ppm and 35 ppm Cythion, and 0.0006 ppm and 0.008 ppm Hexadrin, respectively). In each reproductive phase, fish were exposed to the pesticides for 4 wk. After 4 wk, liver, ovary and blood serum were analyzed for lipid and cholesterol. The pesticides induced a significant decrease in liver lipid concentrations during the preparatory and late post-spawning phases only. No changes resulted in the ovary lipid levels. However, an appreciable increase in ovarian cholesterol occurred in pre- and post-spawning phases at all concentrations. The authors contend that even levels of these pesticides generally considered to be safe alter lipid and cholesterol metabolism in the fish *Heteropneustes fossilis.*

81-0508. Hall, R. J.; Swineford, D. (U.S. Fish & Wildl. Serv., Patuxent Wildl. Res. Cent., Laurel, MD 20811) **Toxic effects of endrin and toxaphene on the southern leopard frog *Rana sphenocephala*.** *Environ. Pollut.* 23(1): 53-65; 1980 (29 references).

The toxic effects of endrin and toxaphene on the southern leopard frog were determined. Eggs, larvae and subadults were exposed to a range of concentrations of these pesticides for a determination of LC50 values. The eggs appeared to be resistant to these compounds. Endrin LC50 values for both larvae and subadults were 0.005-0.015 ppm. Toxaphene was less toxic to the subadults (LC50 of 0.378-0.790 ppm) than to the larvae (LC50 of 0.032-0.054 ppm). The post exposure effects of both of these pesticides warrants the recommendation that toxicity tests on amphibians be no less than 96 hr and extend to at least 30 days.

81-0509. Rath, S.; Misra, B. N. (Lab. Environ. Toxicol., Dep. Bot., Berhampur Univ., Berhampur 760007, Orissa, India) **Age-related changes in oxygen consumption by the gill, brain, and muscle tissues of *Tilapia mossambica* Peters exposed to dichlorvos (DDVP).** *Environ. Pollut.* 23(2): 95-101; 1980 (11 references).

Studies were performed to determine the effects of dichlorvos (DDVP) on oxygen (O_2) consumption by fish tissues of varying age. Three size (age) groups were exposed to 0.5 mg/l of DDVP for 28 days. At 7 day intervals, fish from each age group were killed and gill, brain and muscle tissues were dissected out. O_2 consumption was measured by a Warburg apparatus. In a second set of experiments, fish from each age group were also removed at 7 day intervals, but were placed in untreated water (no DDVP) for a wk prior to measurement of O_2 consumption. O_2 consumption was age specific for all tissues. O_2 consumption was highest for low wt and decreased with increased wt. Gill O_2 uptake was greater than muscle and brain O_2 uptake at all wt. The O_2 consumption of all groups and tissues of DDVP exposed fish was less than in controls. Fish that had been transferred to untreated water showed a greater O_2 uptake by muscle. Tissues from the older fish demonstrated the lowest O_2 uptake rates at all exposure periods, whereas the youngest group demonstrated the highest uptake.

81-0510. Magistrini, M.; Szollosi, S. (Stn. Cent. Physiol. Anim., INRA, Jouy-en-Josas, France) **Effects of cold and of isopropyl-*N*-phenylcarbamate on the second meiotic spindle of mouse oocytes.** *Eur. J. Cell Biol.* 22(2): 699-707; 1980 (37 references).

Ovulated mouse oocytes were used in studies on the action of cold and of the herbicide isopropyl-*N*-phenylcarbamate (IPC; propham), separately or in combination, on the second meiotic spindle. IPC is known to be an antimitotic agent. Test tubes containing oocytes in Ham F10 medium were incubated in crushed ice for up to 60 min, then gradually warmed. In another experiment, 2×10^{-4} *M* IPC was added to the medium. Oocytes were examined by electron microscopy. In those cells cooled on crushed ice, the spindle microtubules were disorganized between 15 and 60 min of treatment. Continuous microtubules disorganized first, followed by kinetochore fibers. When oocytes were treated with IPC after cold disorganization, IPC disturbed microtubule orientation, and the relative distance between microtubular organizing centers and chromosomes. The herbicide, whose action was reversible, did not act on polymerized microtubules.

81-0511. Montgomery, M. R.; Wyatt, I.; Smith, L. L. (Pulmon. Toxicol. Lab., VA Hosp., Minneapolis, MN 55455) **Oxygen effects on metabolism and paraquat uptake in rat lung slices.** *Exp. Lung Res.* 1(3): 239-250; 1980 (17 references).

Effects of hyperoxia and hypoxia on paraquat accumulation in rat lung slices were studied on samples of lung tissue. Accumulation was inhibited in hypoxic environments due to the fact that accumulation is an energy-dependent process sensitive to inhibitors of oxidative metabolism. Paraquat accumulation was very sensitive to oxygen availability. However, accumulation into lung slices was not potentiated by a hyperoxic environment. Paraquat accumulation into lung tissue cannot explain the *in vivo* potentiation of paraquat pulmonary toxicity that has been observed in hyperoxic environments. It appears that paraquat accumulation in the lung was dependent on the presence of relatively high oxygen tensions and was stable to the destructive effects of anoxic incubation. Accumulation proceeded at normal rates even when the total tissue oxygen consumption was decreased 50%. The hypoxic effect is probably due to a deficit in oxygen availability at the transport site.

81-0512. Vijayalakshimi, S. (Dep. Zool., Sri Sathya Sai Women's Coll., Anantapur 515001, India) ***In vivo* effects of Sumithion on tissue respiration and enzyme activity in the fish, *Etroplus maculatus*.** *Experientia* 36(11): 1280-1281; 1980 (14 references).

LD50 exposure of a teleost fish, *Etroplus maculatus*, to Sumithion (fenitrothion) depressed the rate of oxygen consumption, concomitantly with an inhibition in succinate dehydrogenase activity in the tissues, in the order gill > brain > liver > muscle. The effect of the same pesticide on the activity of acetylcholinesterase was quite interesting, with a maximal inhibitory effect on the brain followed by liver, muscle and gill, suggesting a tissue specificity, and a differential sensitivity of the enzyme towards the pesticide. (Author abstract by permission)

81-0513. Cooper, P. (Author address not given) **More experimental data on hexachlorobenzene.** *Food Cosmet. Toxicol.* 18(5): 543-545; 1980 (10 references).

Current data on hexachlorobenzene (HCB) toxicity to man and its effects on experimental organisms is briefly reviewed. Reports on HCB carcinogenicity in hamsters, mice and monkeys indicate a dose-response relationship between HCB ingestion and tumor incidence. Mouse lifespan and mouse and monkey growth rates were significantly decreased by HCB dosing. Placental transfer in mice was observed to be dose-dependent. Distribution and excretion studies in mice, rats and monkeys indicate there is little urinary HCB excretion (< 2%) and some fecal HCB excretion (17-28%). Fat and bone marrow retained highest amounts of HCB. There was an inverse relationship between radiolabel levels and experiment length. Delayed exposure to toxic levels of HCB could occur if HCB-laden depot fat is mobilized.

81-0514. Anonymous **DBCP – a possible mechanism?** *Food Cosmet. Toxicol.* 18(5): 548; 1980 (6 references).

A brief review of the spermatogenic effects of dibromochloropropane (DBCP) in male humans is presented. Published epidemiological surveys of occupational users, including farmers, manufacturing-plant workers, and researchers, and non-users, of DBCP indicate statistically significant reductions of sperm counts in DBCP-exposed men. High levels of LH and FSH are also associated with the low sperm counts. Unscheduled DNA synthesis in pre-meiotic germ cells of mice was assayed as a possible mechanism of DBCP action. Statistically significant unscheduled DNA synthesis was observed. It is postulated that an aliphatic epoxide of debrominated DBCP may react with DNA in the pre-meiotic germ cells to cause saturation of the DNA-repair capacity in germ cells and consequent germinal aplasia.

81-0515. Barabas, K.; Berencsi, G.; Szabo, L.; Varga, S. I.; Matkovics, B. (Biol. Isot. Lab., A.J. Univ. Szeged, H-6701 Szeged 1, Hungary) **Enhancing effect of aminotriazole on paraquat toxicity *in vivo*.** *Gen. Pharmacol.* 11(6): 569-572; 1980 (14 references).

The joint action of aminotriazole (AT; amitrole) and paraquat (PQ) was studied. Mice were concurrently treated with AT ip and the LD50 of PQ (120 mg/kg) po. The onset of death was advanced by the presence of AT. Enzyme activities showed that the combination of AT and PQ alters the SOD, peroxidase (P-ase), catalase (C-ase) and P-450 activities in liver, lung and kidneys. The results may vary depending on the dose levels of AT. A high AT dose causes a temporary increase of SOD. Low AT causes a decrease in SOD activity. High AT causes a temporary decrease in P-ase activity, followed by an increase within 3 hr. Low AT levels decrease P-ase activity. C-ase activity alterations vary from tissue to tissue. Liver C-ase is unaffected while in the kidney C-ase activity decreased at all AT levels. Analysis of changes in lipid peroxidation (LP) and P-450 show that joint administration of AT and the LD50 of PQ leads to biochemical changes which explain the rapid onset of mortality.

81-0516. Bessmertnova, N. V. (Res. Inst. Epidemiol. & Microbiol., Lvov, USSR) **Eksperimental'nye dannye k gigienicheskomu normirovaniyu benatsila v vode vodoemov. [Experimental data for hygienic standardization of benacil concentration in bodies of water.]** *Gig. Sanit.* 45(10): 71-72; 1980 (Russian).

The results of the experimental study of the maximum permissible concentrations (MPC) of the fungicide Benatsil (Benacil; 1-phenoxyacetyl- 2-methoxycarbonylaminobenzimidazol) in bodies of water are reported. Organoleptic analysis showed that the water containing Benacil at 95.7 mg/l had a weak specific odor. Benacil at 100 and 300 mg/l decreased oxygen consumption by 21-32%. Acute toxicity of Benacil was studied in albino mice and rats: only 1 mouse and 1 rat died after exposure to 15 and 10 mg/kg. Benacil was found to lack cumulative properties. Prolonged po administration of Benacil at 0.5 and 5 mg/kg (doses corresponding to concentrations in bodies of water of 10 mg/l and 100 mg/l, respectively) did not change the functional state of rats. Benacil at 50 mg/kg increased the level of SH-groups in the blood and activity of catalase and peroxidase. It was concluded that 10 mg/l can be recommended as the MPC of Benacil in the bodies of water.

81-0517. Agarwal, N.; Sanyal, S.; Khyller, G. K.; Chakravarti, R. N.; Subrahmanyam, D. (Dep. Biochem. Exp. Med., Postgrad. Inst. Med. Educ. Res., Chandigarh 160012, India) **Effect of DDT on lipid metabolism of rhesus monkey.** *Indian J. Biochem. Biophys.* 17(5): 242-245; 1980 (17 references).

The effects of exposure to DDT on lipid metabolism of rhesus monkeys was studied. Animals were given oral doses of 10 mg DDT/kg body wt daily for 100 days. At the end of the experimental period, some animals were used for metabolic studies. Others were sacrificed; lipid levels and other biochemical parameters were determined in plasma and other tissues. There was a significant increase in plasma total lipids, triglycerides, FFA and total phospholipid levels. There was a significant decrease in total lipid and triglycerides in the adipose tissue and of triglyceride in the liver, and an increase of total phospholipid in the liver. It is suggested that the hypertriglyceridemia may be due to increased hepatic lipogenesis and secretion of the lipid into the circulatory system, decreased removal of lipid from plasma, and decreased catabolism of triglyceride-rich lipoproteins by lipoprotein lipase.

81-0518. Bai, K. M.; Krishnakumari, M. K.; Ramesh, H. P.; Shivanandappa, T.; Majumder, S. K. (Infest. Control & Pestic., Cent. Food Technol. Res. Inst., Mysore 570013, India) **Short term toxicity study of zinc phosphide in albino rats *(Rattus norvegicus)*.** *Indian J. Exp. Biol.* 18(8): 854-857; 1980 (19 references).

The short term effects of zinc phosphide on albino rats were studied. Rats were fed diets containing 0, 50, 100, 200 and 500 ppm of the rodenticide for 13 wk. Doses of 50 and 100 ppm caused no mortality. The 200 ppm dose caused 8% mortality, and 500 ppm caused 83% mortality. All doses resulted in decreased food intake and body wt. Doses of 200 and 500 ppm caused increased relative wt of liver, heart, brain and thyroid; 500 ppm also increased serum zinc and liver alkaline phosphatase. Dose dependent hair loss was also observed.

81-0519. Pushpendran, C. K.; Devasagayam, T. P. A.; Banerji, A.; Eapen, J. (Biol. Group, Bhabha At. Res. Cent., Bombay 400085, India) **Cholesterol-lowering effect of allitin in suckling rats.** *Indian J. Exp. Biol.* 18(8): 858-861; 1980 (30 references).

Studies were conducted which characterized the effects of allitin on cholesterol levels in rats. Allitin consists of 98% diallyl disulfide and 2% diallyl trisulfide (components of garlic oil, which is known to have insecticidal properties). Fifteen day old rats were injected with 0, 10, 25, 50 and 100 mg/kg allitin and sacrificed at various intervals. Cholesterol and total lipid content of various tissues was determined. After the 100 mg/kg dose, blood cholesterol dropped from 100 to < 50 mg/100 ml after 30 min, then rose back to > 100 mg/100 ml. Liver cholesterol increased after injection, then declined to less than the original level. Total lipids followed essentially the same pattern. Exposure to various concentrations from 0 to 100 mg/kg resulted in greatly decreased blood cholesterol levels at the 100 mg/kg dose, but varying levels similar to controls at the other doses. Liver cholesterol varied little after 1 hr exposure to all levels. Liver total lipids were lowest after 50 mg/kg. Blood total lipids varied greatly at different dosages, with 25 mg/kg causing the highest levels, and 100 mg/kg causing the lowest.

81-0520. Koss, G.; Koss, G.; Seubert, S.; Seubert, A.; Koransky, W.; Kraus, P.; Ippen, H. (Inst. Toxikol. & Pharmacol., Philipps Univ., D-3550 Marburg, BRD) **Conversion products of hexachlorobenzene and their role in the disturbance of the porphyrin pathway in rats.** *Int. J. Biochem.* 12(5-6): 1003-1006; 1980 (12 references).

The effects of HCB conversion products on the porphyrin pathway in rats were studied. Rats were dosed every other day with 100 mg/kg HCB; or daily with 23.5 mg/kg pentachlorophenol (PCP) or 24.8 mg/kg pentachlorothiophenol $HgCl_2$ was given at a dose of 1 mg/kg daily. ^{14}C-HCB was administered orally at a dose of 0.36 mmol/kg. Twenty-four hr after the last treatment, rats were killed and their livers removed, weighed and analyzed. HCB and $HgCl_2$ caused increased uroporphyrin and a decrease in coproporphyrin in the liver. It was seen that liver cytosol proteins were capable of binding labeled carbon, derived from the labeled HCB. The conversion of 1,2-epoxy-3-(*p*-nitrophenoxy)propane is decreased due to inhibition of the necessary enzyme. Possible mechanisms of action of HCB conversion products on porphyrin metabolism are described.

81-0521. Day, R. S.; Blekkenhorst, G. H.; Eales, L. (Porphyria Res. Unit, Dep. Med., Med. Sch., Univ. Cape Town, Observatory 7925, Cape, South Africa) **Drug induced acute porphyric episodes in rats.** *Int. J. Biochem.* 12(5-6): 1007-1011; 1980 (17 references).

Male and female rats were given food containing 0.2% or 0.07% hexachlorobenzene (HCB) by weight to study the induction of acute porphyria. At various intervals, fecal and urinary samples were collected, and the porphyrins present in red blood cells, plasma, urine and feces were esterified, extracted, and measured by fluorescence scanning using a quantitative TLC technique. Porphyrins in homogenates of various tissues were also measured in a similar way. The ó-aminolevulinic acid (ALA) and porphobilinogen (PBG) levels were measured in urine, plasma, and some tissue homogenates. Results indicated that, while the 0.2% HCB dose caused death in 33% of the rats within the first 4 wk, only mild changes occurred in their excreted porphyrins. However, in the 0.7% dose group, very few deaths occurred and an intermediate porphyric phase was clearly established. After 25 days of 0.07% HCB treatment, the rats showed coproporphyrinuria and mild elevation of fecal coproporphyrins and protoporphyrins. The levels rose even further by 50 days, and resembled amounts found in mild cases of human variegate porphyria. It was determined that few of the excreted porphyrins were of hepatic origin, with fecal porphyrins being synthesized in the intestinal tract and urinary porphyrins originating mainly in the kidney.

81-0522. Blekkenhorst, G. H.; Day, R. S.; Eales, L. (Porphyria Res. Unit, Dep. Med., Med. Sch., Univ. Cape Town, Observatory 7925, Cape, South Africa) **The effect of bleeding and iron administration on the development of hexachlorobenzene- induced rat porphyria.** *Int. J. Biochem.* 12(5-6): 1013-1017; 1980 (20 references).

Studies were conducted to determine the effects of increased and decreased iron on HCB (hexachlorobenzene) -induced porphyria in rats. Three groups of rats were fed 0.2% (w/w) HCB. Group 1 (controls) had 2 ml blood removed on days 8, 20, 34 and 48. Group 2 rats were given only HCB treatment, and group 3 rats were given 25 mg iron/kg twice weekly and blood samples were taken as in controls. Animals from each group were killed at various

intervals after 24 hr starvation during which urine and feces were collected. Various organs were also removed and studied. The results indicated a significant increase in porphyrin in iron-over loaded rats, and diminished porphyria in iron-depleted rats. Colonic and renal uroporphyrinogen decarboxylase activity appears to be related to fecal and urinary uroporphyrin excretions. The porphyria occurred in two stages, the second was similar to the human disease.

81-0523. Debets, F. M. H.; Hamers, W. J. H. M. B.; Strik, J. J. T. W. A. (Dep. Toxicol., Agric. Univ., Biotechnion, NL-6703 BC Wageningen, The Netherlands) **Metabolism as a prerequisite for the porphyrinogenic action of polyhalogenated aromatics, with special reference to hexachlorobenzene and polybrominated biphenyls (Firemaster BP-6).** *Int. J. Biochem.* 12(5-6): 1019-1025; 1980 (32 references).

Studies were conducted to determine the nature of porphyrinogenic action of some aromatic compounds. Embryonic chick liver cells were incubated with HCB (hexachlorobenzene) or HBB at concentrations of 10 μg/ml. Some of the cells were pretreated with the enzyme-inducing compounds β-naphthoflavone (β-NF), phenobarbitol (PB) and 3-methylcholanthrene (3-MC). After incubation, the morphology of cells was observed and porphyrin fluorescence was determined. Porphyrins were then extracted from the cells to quantify content and patterns of accumulation. The pre-treatment caused a significant increase in the accumulation of porphyrins after exposure to the poly-halogenated hydrocarbons HCB and HBB. It appears that when HCB and HBB are metabolized, an intermediate degradation product inhibits the uroporphyrin decarboxylating enzymes and leads to the observed increase in porphyrins. The authors have shown that metabolism of porphyrinogenic compounds is necessary before their action can be initiated.

81-0524. Rios de Molina, M. D. C.; Wainstock de Calmanovici, R.; San Martin de Viale, L. C. (Lab. Porfirinas, Dep. Quim. Biol., Fac. Cienc. Exactas & Nat., Univ. Buenos Aires, 1428 Buenos Aires, Argentina) **Investigations on the presence of porphyrinogen carboxy-lyase inhibitor in the liver of rats intoxicated with hexachlorobenzene.** *Int. J. Biochem.* 12(5-6): 1027-1032; 1980 (16 references).

Studies were performed to investigate the presence of porphyrinogen-related enzyme inhibitors in the livers of HCB (hexachlorobenzene) treated rats. Rats were administered 1 g/kg HCB every 2-3 days. Animals with severe porphyria after 2-3 mo were used for liver analysis. Results of these studies indicate that an inhibitor of hepatic porphyrinogen-carboxy-lyase (PCL) is tightly bound to the porphyric enzyme. Several drugs inhibit hepatic PCL, mainly pentachlorophenol (PCP), tetrachlorophenol and 2,4-dinitrophenol. Evidence is known that inhibition could be due to PCP and not HCB. The actin of PCP, however, was not observed at concentrations less than 10^{-5} *M*. The authors contend that the inhibitory effects that occur when PCP is less than 10^{-5} *M* could be the result of the sum of the inhibitory effects of several HCB metabolites.

81-0525. Taira, M. C.; San Martin de Viale, L. C. (Lab. Porfinas, Dep. Quim. Biol., Univ. Buenos Aires, 1428 Buenos Aires, Argentina) **Porphyrinogen carboxy-lyase from chick embryo liver – *in vivo* effect of heptachlor and lindane.** *Int. J. Biochem.* 12(5-6): 1033-1038; 1980 (17 references).

Studies were performed to determine the effects of heptachlor and and lindane on porphyrinogen carboxylyase (PCL). Chick embryos were dosed with 1 and 2 mg lindane/egg and 10 and 20 mg heptachlor/egg. After incubation the livers were analyzed. Results indicated that lindane dosing resulted in more porphyrin accumulation than heptachlor. Enzyme inhibition appears to be dependent on the species of chicken used and the stage of development. Inhibition occurred in white leghorn embryos and New Hampshire newborn chicks, but not in New Hampshire embryos. It is evident that some of the metabolites of the pesticides are responsible for PCL inhibition.

81-0526. Wainstock de Calmanovici, R.; San Martin de Viale, L. C. (Lab. Porfirinas, Dep. Quim. Biol., Fac. Cienc. Exactas & Nat., Univ. Buenos Aires, 1428 Buenos Aires, Argentina) **Effect of chlorophenols on porphyrin metabolism in rats and chick embryo.** *Int. J. Biochem.* 12(5-6): 1039-1044; 1980 (25 references).

Studies were performed to determine if PCP produces disturbances in porphyrin metabolism similar to those caused by HCB (hexachlorobenzene). Female rats were given technical PCP at doses of 45-55 mg/kg/day in mo 1, and 70-90 mg/kg/day in mo 2. Purified PCP was administered at 110-140 mg/kg/day in mo 1 and increased to 170-195 mg/kg/day for the next 4 mo. Chick embryos, 17-day-old, were injected at doses of 3 and 10 mg/egg and sacrificed at various intervals for biochemical analysis of the livers. Results indicate that technical PCP increases the excretion of porphyrins PBG and ALA in rats; the peak occurred at 15-16 wk. Purified PCP, however, did not cause increased excretion. Livers, kidneys, and spleens of rats showed increased accumulated porphyrins due to technical PCP. Levels in livers, kidneys and spleens were 970 μg/g, about 25 μg/g, and about 10 μg/g, respectively, compared to controls which were about 2-3 μg/g. Purified PCP did not alter the porphyrin content. The activity of δ-ALA-synthetase in rat liver was increased by about 2.5 times by technical PCP but not purified PCP. Only in chick embryos did the purified PCP caused increased porphyrin accumulation and ALA-synthetase activity.

81-0527. Senger, H.; Ruhl, D. (Fachb. Biol. Bot., Philipps Univ., D-3550 Marburg, BRD) **The influence of pentachlorophenol on the biosynthesis of 5-aminolevulinic acid and chlorophyll.** *Int. J. Biochem.* 12(5-6): 1045-1048; 1980 (24 references).

Studies on the mode of action of pentachlorophenol (PCP) on tetrapyrrole biosynthesis was studied in the pigment mutant C-2A′ of the green alga *Scenedesmus obliquus*. This mutant does not form chlorophyll when grown heterotrophically in the dark, but rapidly synthesizes chlorophyll when exposed to light. Also known to be light-dependent are the formation of 5-aminolevulinic acid (ALA), a key intermediate in tetrapyrrole formation, and the formation of the enzyme of ALA synthesis. PCP was added to culture under various conditions, then chlorophylls, ALA, and ALA synthetase were determined, along with photosynthetic oxygen evolution and respiratory oxygen uptake. Addition of PCP to dark-grown cultures prior to illumination markedly inhibited chlorophyll formation and ALA in a parallel fashion. ALA synthetase was not inactivated by PCP, but its formation was inhibited by PCP to the same extent as ALA biosynthesis. Total protein formation and the activity of structurally-bound photosystem II of photosynthesis were also inhibited, with respiration being stimulated at lower PCP concentrations. It is concluded that PCP may have a general and far-reaching effect on metabolism, possibly by modifying membrane structure or formation.

81-0528. Newton, I.; Marquiss, M.; Moss, D. (Inst. Terr. Ecol., Monks Wood Exp. Stn., Huntingdon PE17 2LS, England) **Habitat, female age, organochlorine compounds, and breeding of European sparrowhawks.** *J. Appl. Ecol.* 16(3): 777-793; 1979 (16 references).

Associations between habitat, female age, organochlorine pesticide content and breeding in sparrowhawks were examined. Breeding was better in mixed forest and farmlands due to the higher concentrations of prey. Larch and pine were preferred as nest trees. The proportion of survivorship of young increased as the tree cover increased. Mating was not random with respect to age. There were fewer adult-yearling and more yearling-yearling and adult-adult matings. High levels of DDE and PCBs in eggs were associated with nest failure. Shell thinning and egg breakage were highly correlated to DDE concentrations. The mean DDE and PCB concentrations in successful nests were 116 and 62 ppm, respectively. The levels of these contaminants averaged 154 and 84 ppm in nests that failed.

81-0529. Georghiou, G. P.; Pasteur, N. (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Organophosphate resistance and esterase pattern in a natural population of the southern house mosquito from California.** *J. Econ. Entomol.* 73(4): 489-492; 1980 (9 references).

The esterase pattern of locus *Est-B* and the organophosphate (OP) resistance genotype of single mosquitoes from a natural population of *Culex quinquefasciatus* Say were investigated. The *Est-B* polymorphism was found to involve: allozymes with different electrophoretic mobilities (esterase-1 and -2), and allozymes with different staining intensities (esterase-2a, -2b, and -2c). The most active allozyme (esterase-2c) is always associated with OP-resistant genotypes, while the less active allozymes (esterase-1 and -2a) with OP-susceptible genotypes. It also appears that esterase-2b, which has a slightly higher activity than esterase-1 or esterase-2a, is associated with a small decrease in OP susceptibility. The role of *Est-B* locus in OP resistance is discussed. (Author abstract by permission)

81-0530. Desaiah, D. (Dep. Neurol., Med. Cent., Univ. Mississippi, Jackson, MS 39216) **Comparative effects of chlordecone and mirex on rat cardiac ATPases and binding of ^{3}H-catecholamines.** *J. Environ. Pathol. Toxicol.* 4(1): 237-248; 1980 (38 references).

In vivo and *in vitro* experiments were performed on the effects of chlordecone and mirex on rat myocardial ATPases and the binding of tritium-labeled dopamine and norepinephrine to the NAK-fraction. Mg^{2+} ATPase and Na^+–K^+ATPase were significantly inhibited by chlordecone in a concentration dependent manner. Mirex did not inhibit the mitochondrial Mg^{2+}ATPase, but did inhibit the Na^+–K^+ATPase activity about 15%. Chlordecone was able to inhibit the ATPase system in direct relation to its ability to decrease the dopamine and norepinephrine binding of the myocardial NAK-fraction. A decreased binding of dopamine and norepinephrine was brought about by preincubation of the NAK-fraction with various chlordecone concentrations. Mirex demonstrated no effect in either *in vitro* or *in vivo* testing on the binding of dopamine or norepinephrine to the myocardial fraction. It is suggested that chlordecone may change the sodium pump activity through inhibition of both ATP hydrolysis and ATP synthesis. This would reduce cellular events such as catecholamine uptake.

81-0531. Reifenrath, W. G.; Hill, J. A.; Robinson, P. B.; McVey, D. L.; Akers, W. A.; Anjo, D. M.; Maibach, H. I. (Dep. Dermatol., Letterman Army Inst. Res., Presidio San Francisco, CA 94129) **Percutaneous absorption of carbon 14 labeled insect repellents in hairless dogs.** *J. Environ. Pathol. Toxicol.* 4(1): 249-256; 1980 (9 references).

Topical and iv applications of ^{14}C labeled insecticides m-deet, p-deet, and 2-ethyl,1,3-hexanediol were made to hairless dogs. After topical administration, the excretion of chemicals was nearly complete after 4-5 days. Radioactivity levels in blood samples after topical administration were too low to be accurately measured. Peripheral protective patches used in topical experiments

demonstrated substantial amounts of contamination. Within 48-96 hr after application only small amounts of radioactivity were recovered from the skin. The rate of urinary excretion after iv administration was comparable to that recorded in humans. It is suggested that the permeability of the hairless dog's skin may be quite similar to that of human skin.

81-0532. Glazer, E. J.; Baker, T.; Riker, W. F. (Dep. Pathol., Med. Coll., Cornell Univ., New York, NY 10021) **The neuropathology of DFP at cat soleus neuromuscular junction.** *J. Neurocytol.* 7: 741-758; 1979 (29 references).

Studies were performed on the neuropathological effects of di-isopropylfluorophosphate (DFP) at the soleus neuromuscular junction in cats. Following a single injection of 2 mg/kg DFP into the right femoral artery, methylene blue biopsies were conducted on the soleus intramuscular nerves at intervals of 1, 2, 3, 4, 6 and 8 days post poisoning. Biopsies were conducted by injecting methylene blue into the muscle, fixing it in ammonium molybdate, and teasing out small fascicles for squash preparations. After 3 days, motor nerve terminals were reduced in numbers. Pre- and post-junctional subacute changes were resolved in 2 wk. This regeneration was followed by temporary degeneration in the next wk, but by 6-8 wk the damaged end plates were reinnervated. Reinnervation took place principally by regeneration of the original motor axon. The damage was believed to be a result of local actions of DFP on the non-myelinated terminal. There is an apparent delayed acute effect which is responsible for the onset of degeneration 2 wk post poisoning.

81-0533. Otagiri, M.; Matsumoto, U.; Perrin, J. H. (Fac. Pharm. Sci., Kumamoto Univ., Kumamoto 862, Japan) **Interaction of warfarin with human serum albumin.** *J. Pharmacobiodyn.* 3(9): S2; 1980.

Circular dichroism, fluorescence and equilibrium dialysis techniques were used to investigate the binding of warfarin to human serum albumin (HSA). The effect of anti-inflammatory drugs on the binding of warfarin to HSA was also investigated at low drug to HSA ratios. Circular dichroism studies suggest that warfarin may have 2 different sites on HSA with different affinities. Salt effects indicate that calcium and chloride ions affect the binding of warfarin to HSA by different mechanisms. The binding of S(-) warfarin was more affected by the addition of sodium chloride than R(+) isomer. Phenylbutazone, tolmetin and flufenamic acid displaced warfarin from its first binding site. Aspirin and fenoprofen did not displace any warfarin. Ibuprofen gave a small enhancement of the fluorescence of warfarin.

81-0534. Wedemeyer, G. A.; Saunders, R. L.; Clarke, W. C. (Natl. Fish. Res. Cent., US Fish & Wildl. Serv., Seattle, WA 98115) **Environmental factors affecting smoltification and early marine survival of anadromous salmonids.** *Mar. Fish. Rev.* 42(6): 1-14; 1980 (116 references).

A report is presented in which the factors affecting low ocean survivorship of artificially propagated salmon are discussed. Less than 10% of hatchery coho salmon survive, whereas as much as 32% of wild Atlantic salmon survive. Many factors which must be considered when raising fish in a hatchery were reviewed, including physiological changes, hypoosmotic regulatory capability, salinity tolerance and enzyme activity. Environmental parameters that could influence these physiological factors include heavy metals, water temperature, photoperiod, and exposure to pesticides. Exposure of coho salmon smolts to the herbicide Tordon 101 (picloram + 2,4-D) at 0.6-1.8 mg/l for 96 hr prevented successful migration upon release. Low levels of 2,4-D are known to cause an avoidance response in nonanadromous steelhead trout. Recommendations for increasing survivorship are discussed.

81-0535. Generoso, W. M.; Cain, K. T.; Krishna, M.; Sheu, C. W.; Gryder, R. M. (Biol. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830) **Heritable translocation and dominant-lethal mutation induction with ethylene oxide in mice.** *Mutat. Res.* 73(1): 133-142; 1980 (19 references).

Ethylene oxide was studied for induction of dominant-lethal mutations and heritable translocations in male mice. The chemical was prepared in water and injected ip. The dominant-lethal study was conducted using a single injection of 150 mg/kg (maximum tolerated dose); in the heritable translocation study males were injected daily on weekdays for 5 wk with 60 or 30 mg/kg dose/day. Results clearly showed that ethylene oxide is effective in inducing dominant-lethal mutations and that the 4 stocks of untreated females used do not differ or may differ only slightly in the ability of their eggs to repair ethylene oxide-induced lesions in male germ cells. Increases in the frequencies of heritable translocations were also observed at the 2 dose levels. These frequencies did not deviate significantly from those expected on the basis of dose-square kinetics. (Author abstract by permission)

81-0536. Rietbrock, N.; Lassmann, A. (Abt. Klin. Pharmakol., Johann Wolfgang Goethe Univ., D-6000 Frankfurt, BRD) **Stopped-flow studies on drug-protein binding. 1. Kinetics of warfarin binding to human serum albumin.** *Naunyn-Schmiedebergs Arch. Pharmacol.* 313(3): 269-274; 1980 (13 references).

We have studied the binding of warfarin to human serum albumin (HSA) with the stopped-flow method. At 37°C the rate constant for the velocity of dissociation of the stable warfarin-HSA complex is $10s^{-1}$ (t_{so} = 0.07s). Concentration and temperature dependent association constants for warfarin binding to HSA have been measured

($2.5 \times 10^5\ M^{-1}s^{-1}$ at 6°C, $9.8 \times 10^5\ M^{-1}s^{-1}$ at 22°C and $15.3 \times 10^5\ M^{-1}s^{-1}$ at 37°C). Our experimentally obtained relaxation constants are best explained by the existence of 5 equivalent low affinity binding sites for warfarin on the HSA molecule, each capable of conversion into a high affinity site. The measured energy of activation for this conversion is 57.5 kJ/*M*. (Author abstract by permission)

81-0537. Gray, A. J.; Connors, T. A. (MRC Toxicol. Unit, Med. Res. Counc. Lab., Carshalton, Surrey SM5 4EF, England) **Delayed toxicity after intravenous administration of bioresmethrin to rats.** *Pestic. Sci.* 11(3): 361-366; 1980 (6 references).

Capillary gas-liquid chromatographic analysis of 7 commercial samples of bioresmethrin demonstrated that each contained toxicologically significant amounts (1-5%) of the (1R)-*cis*-isomer (cismethrin) as an impurity. Intravenous injection of the labeled compounds to rats indicated that the concentrated solutions of these compounds may precipitate in the blood and subsequently become trapped in the lung. Slow release of the toxic isomer impurity probably accounts for the delay in appearance of symptoms after iv administration of impure bioresmethrin. Similarly, higher doses of cismethrin can be tolerated when concentrated solutions are administered iv. (Author abstract by permission)

81-0538. David, D. (Lab. Biol. Anim., Univ. Clermont Ferrand, CNRS, F-63170 Aubiere, France) **Residual DDT in two successive generations of quail and their eggs.** *Poult. Sci.* 59(6): 1183-1186; 1980 (20 references).

Gas chromatographic analysis of residual DDT levels following external treatment of parent eggs shows contamination to be present not only in first generation quails but also in second generation eggs laid at the beginning of the laying period and in chicks and adults hatched from them. However, the amount of pesticide detected in second generation eggs laid lately and in all third generation eggs was not significantly higher than that found in control samples. (Author abstract by permission)

81-0539. Srihari, K.; Sridhara, S. (Dep. Vertebr. Biol., Univ. Agric. Sci., Bangalore 560065, India) **Haematological studies on two rodents after zinc phosphide and Vacor poisoning.** *Proc. Indian Acad. Sci. (Anim. Sci.)* 89(2): 183-190; 1980 (25 references).

The lesser bandicoot (*Bandicota bengalensis*) and the Indian gerbil (*Tatera indica*) were used in hematological studies on effects of sublethal poisoning with zinc phosphide and Vacor (pyriminil). All rodents used were caught in the field and acclimated to laboratory conditions prior to testing. Animals were fed on either 0.05% zinc phosphide in 5 g bait or 0.02% Vacor in 2 g bait (sublethal doses). Blood was collected by severing the caudal vein, and various hematological parameters determined. The 2 rodenticides caused similar effects. Lymphocytes decreased, while red blood cells and neutrophils, and bleeding and clotting times increased. Evidence is presented to suggest sex- and species-dependent susceptibility to the 2 poisons.

81-0540. Loomis, C. W.; Racz, W. J. (Dep. Pharmacol., Queen Univ., Kingston, Ontario K7L 3N6, Canada) **Drug interactions of amitriptyline and nortriptyline with warfarin in the rat.** *Res. Commun. Chem. Pathol. Pharmacol.* 30(1): 41-59; 1980 (27 references).

Studies were performed to determine the interactions of warfarin, amitriptyline and nortriptyline in rats. Rats were given 6, 15 and 30 mg/kg amitriptyline or nortriptyline, ip, for 6 days. Other rats were given this treatment followed 1 hr later by an iv dose of (2.5 mg/kg) warfarin. The 6 and 15 mg/kg treatment with amitriptyline and nortriptyline produced no increase in the activities of aniline hydroxylase and aminopyrene N-demethylase or the microsomal protein or cytochrome P-450 levels. The 30 mg/kg dose, however, did decrease cytochrome P-450 levels and N-demethylase activity. The addition of warfarin caused a dose-dependent increase in prothrombin time. There is evidence that the prothrombin time correlated to the warfarin half-life in the plasma, and that it reflects competitive inhibition of warfarin metabolism.

81-0541. Sonanwane, B. R.; Baksi, S. N. (Dep. Pediatr., Univ. Pennsylvania, Philadelphia, PA 19104) **Altered thyroid hormone status and dichlorvos toxicity in rats.** *Res. Commun. Chem. Pathol. Pharmacol.* 30(2): 369-372; 1980 (10 references).

Studies were performed to determine the effects of dichlorvos (DDVP) on thyroid hormone levels. Rats were thyroidectomized or induced to hyperthyroidism, and treated with 52.5 mg/kg DDVP. The DDVP treatment caused 30% mortality to non-operated females. Cholinesterase activity was increased by hypothyroidism, but decreased by hyperthyroidism. These effects were observed in both males and females. However, when given equal amounts of DDVP, hyperthyroid females were more susceptible to toxicity than were hyperthyroid males.

81-0542. Paulson, G. D. (Metab. & Radiat. Res. Lab., Agric. Res., SEA, USDA, Fargo, ND 58105) **Conjugation of foreign chemicals by animals.** *Residue Rev.* 76: 31-72; 1980 (162 references).

Animal cells have enzyme systems in strategic locations (cytosol, mitochondria, and endoplasmic reticulum) to conjugate a wide variety of foreign compounds that contain either electrophilic or nucleophilic centers. Animal systems form glucuronic acid and related carbohydrate

conjugates, sulfate ester conjugates, glutathione and related mercapturic acid conjugates, methylated products, acylated products, amino acid and related conjugates, and a few other miscellaneous conjugates. The relative qualitative and quantitative importance of these conjugation reactions is dependent upon many factors which include the nature of the molecule; the species, sex, age, and physiological and nutritional state of the animals; and the size and route of administration of the dose. All the conjugating systems are energetically expensive anabolic processes involving the biosynthesis of high energy nucleotides that serve as substrates for the conjugating transferase enzymes. The conjugates are in general more polar and therefore usually more efficiently secreted in the urine and/or excreted in the bile than the parent compounds. These and other observations during the mid to late 19th century led to the conclusion that the conversion of foreign compounds to polar conjugates is always a detoxification process. Although this is undoubtedly true for many of the foreign compounds that animals are exposed to, there are notable exceptions. More recent studies have shown that in some instances, conjugation may result in a product with greater biological activity than the parent compound. (Author abstract by permission)

81-0543. Ware, G. W. (Dep. Entomol., Univ. Arizona, Tucson, AZ) **Effects of pesticides on nontarget organisms.** *Residue Rev.* 76: 173-201; 1980 (104 references).

The effects of pesticides on nontarget organisms are not merely object lessons of the past. All effects discussed, those that were omitted from the review, and some that are yet unidentified are being produced at the present. Their magnitude is likely not as great now as when most attention was being devoted to the organochlorine decade (1960 to 1970). It was the organochlorine insecticides and their metabolites that caused the most disruptive influences through time. Because their volume has declined an estimated 90% since the year of greatest use (1964), their major nontarget influences may well be attenuated to a no-effect level by the year 2000. With the present pesticide use patterns, and the restraints surrounding these uses, the nontargets in greatest jeopardy today are obviously those closest to application, the beneficial arthropods. Specifically, these are the predators, parasites, and pollinating insects. It is not uncommon to deplete populations of predators by 80% with the first application of insecticide to a crop. From that moment on, throughout the growing season, the pests have the advantage and require repeated applications, each one depressing the natural enemy population more than the pests. Aquatic organisms are probably the second most jeopardized. From this review, it would appear that of the three classes of the most-used pesticides, the insecticides still offer the greatest potential for detrimental nontarget effects, and the fungicides the least. Herbicides, because of their varied modes of action and range of persistence, fall between the extremes. It is further concluded that soil microorganisms and arthropods and plants are the least endangered. (Author abstract by permission) [Presented at the joint US-Taiwan Seminar, 1979]

81-0544. Darnis, F. (Fac. St. Antoine, Dep. Hepatogastroenterol., Univ. Paris VI, Paris, France) **Role de l'alimentation dans la genese du cancer primitif du foie et de certains autres cancers humains. [The role of diet on the formation of primary liver cancers and certain other human cancers.]** *Rev. Palais Decouverte* 8(80): 38-51; 1980 (French).

Among the many substances ingested with food which may play a role in inducing primary cancer of the liver are PCBs and organochlorine pesticides (including DDT, aldrin, dieldrin, heptachlor and chlordane). DDT repeatedly administered po was found to produce liver cancer in mice and rats after 2.5 yr. DDTs true carcinogenic effect on humans may be underrated since the effects of its long persistence in the environment remains to be assessed. Residues of the herbicides amitrole and diallate present in treated crops were found to be hepatocarcinogenic for mice and rats following po and sc administration. Subliminal quantities of potential hepatocarcinogens may play a synergistic role with high fat diets; simultaneous smoking and alcohol intake may have a cocarcinogenic role in the genesis of intestinal, prostate, orophageal and esophageal cancers.

81-0545. August, D.; Tilson, M. D. (Dep. Surg., Sch. Med., Yale Univ., New Haven, CT) **Modification of myointimal response to arterial injury: effects of aspirin and warfarin.** *Surg. Forum* 31: 337-338; 1980 (3 references).

The effects of aspirin and warfarin were studied on early myointimal proliferative lesions in Sprague-Dawley rats receiving a desiccating injury of the endothelium of the left common carotid artery. One group was given aspirin (160 mg/kg) by gastric lavage 24 hr prior to operation, immediately prior to operation, and daily thereafter. Another group received warfarin (0.1 mg/kg) by gastric lavage 12 hr prior to operation, immediately prior to operation, 36 hr after operation, and daily thereafter. Normal and injured arteries were examined histologically at weekly intervals and the intimal/medial thickness (I/M) ratios were determined. The proliferation response was exaggerated, although not significantly, in aspirin-treated rats, indicating that platelet aggregation inhibited by aspirin appears to play an insignificant role in this type of injury. The myointimal proliferation response was blunted in warfarin-treated rats, indicating that thrombin inhibited by warfarin results in a measurable reduction in the proliferative response after endothelial injury.

81-0546. Barber, D. L.; Colvin, H. W., Jr. (Univ. California, Davis, CA 95616) **Influence of dietary protein**

on the response of rats receiving toxic levels of warfarin. *Toxicol. Appl. Pharmacol.* 56(1): 8-15; 1980 (30 references).

Toxic doses of racemic [^{14}C]warfarin [3-(α-acetoxylbenzyl) -4-hydroxycoumarin] were administered (0.8 mg/kg, po) for 5 days to rats fed one of three different purified diets, 25% casein, 8% casein, and casein-free. Four rats from each dietary group were bled at 6, 30, 54, 78, and 102 hr after the initial dose. Rats consuming a casein-free diet maintained higher total plasma warfarin levels than rats fed a 25 or 8% casein diet. Additionally, percentage free warfarin levels of 0% casein rats were greater than those of 25 and 8% groups through the first 78 hr. An increase in percentage unbound drug was therefore most likely associated with a decrease in total plasma clearance. The protein-free rats had a more rapid increase in prothrombin time and lower plasma albumin levels than rats fed either a 25 or 8% casein diet. A significant correlation was found between the percentage free fraction of warfarin and the prothrombin response in each of the 3 dietary groups. A negative correlation was found between percentage free plasma warfarin and plasma albumin concentration in each of the 3 dietary groups. A correlation was found between total plasma warfarin and prothrombin time for the rats on the 0% protein diet. It was concluded that the quantity of dietary protein was an important factor in determining the response of rats to toxic levels of warfarin. (Author abstract by permission)

81-0547. LaBorde, J. B.; Kimmel, C. A. (Perinatal & Postnatal Eval. Branch, Div. Teratogenesis Res., Natl. Cent. Toxicol. Res., Jefferson, AR 72079) **The teratogenicity of ethylene oxide administered intravenously to mice.** *Toxicol. Appl. Pharmacol.* 56(1): 16-22; 1980 (19 references).

The teratogenic potential of iv administered ethylene oxide (ETO) was assessed in the CD-1 mouse at doses of 0, 75, and 150 mg/kg (in sterile 5% dextrose) at 4 periods during gestation, days 4-6 (Period I), 6-8 (Period II), 8-10 (Period III), and 10-12 (Period IV). Maternal animals showed signs of toxicity at the 150 mg/kg dose level in Periods I, III, and IV but not in Period II. A significant reduction in mean fetal body wt compared to controls occurred in all 4 treatment periods at the 150 mg/kg level, and a significant increase in the percentage of malformed fetuses/litter was observed in Periods II and IV at this dose level. Approximately 19% of the fetuses in each litter from maternal animals treated with 150 mg/kg ETO in Period II had some type of malformation, the majority being of the cervical and thoracic skeleton. These data give evidence for a teratogenic effect of iv ETO in the CD-1 mouse when administered on days 6-8 of gestation at 150 mg/kg. No additional information relative to the effect of ETO could be established from the histopathological examination of randomly selected fetuses. These results indicate teratogenicity at levels 500 to 5000 times above exposure limits currently proposed by the FDA for ETO residues in medical devices. Until more information on comparative teratogenicity and pharmacokinetics are collected, these guidelines would appear to be adequate for preventing undue risk in man. (Author abstract by permission)

81-0548. Aliverti, V.; Bonanomi, L.; Giavini, E.; Leone, V. G.; Mariani, L. (Ist. Zool., Univ. Milano, Milan, Italy) **Effects of glycerol formal on embryonic development in the rat.** *Toxicol. Appl. Pharmacol.* 56(1): 93-100; 1980 (27 references).

The embryotoxic and teratogenic potential of glycerol formal, a solvent used in pharmacological and toxicological experimentation as a vehicle for various therapeutic compounds and organic pesticides (parathion, malathion, dimethoate, DNOC and DDT), was investigated in gravid Sprague-Dawley or Wistar rats on days 6 through 15 of gestation. At dose levels of 0.25-0.50 and 1.00 ml/kg im, sc, and po, glycerol formal induced elevated postimplantation loss rates and a decrease of mean fetal weight in treated groups as compared to control groups. At 0.50 and 1.00 ml/kg im, sc, and po, glycerol formal induced elevated malformation rates. Malformations were mostly limited to cardiovascular defects, particularly ventricular septal defects, and wavy ribs. The embryotoxic and teratogenic effects appeared to be related more to dose and strain of rats used than to route of administration or to any particular day or days of treatment. Maternal toxicity was negligible. (Author abstract by permission)

81-0549. Fasco, M. J.; Cashin, M. J. (Div. Lab. & Res., New York State Dep. Health, Albany, NY 12201) **Effects of induction of *R*- and *S*-warfarin and metabolite concentrations in rat plasma.** *Toxicol. Appl. Pharmacol.* 56(1): 100-109; 1980 (26 references).

The plasma half-lives of *R*- and *S*-warfarin were statistically indistinguishable ($p < 0.05$) for uninduced male Wistar rats, although plasma concentrations of *S*-warfarin were invariably higher at equivalent doses. Induction of hepatic mixed-function oxidase activity by phenobarbital significantly shortened the plasma half-lives and lowered the plasma zero-time concentrations of both enantiomers relative to uninduced rats. In contrast, induction with 3-methylcholanthrene produced a significantly lower than normal zero-time concentration of *R*-warfarin but not of *S*-warfarin. *R*- and *S*-warfarin plasma half-lives did not differ significantly from one another in phenobarbital or 3-methylcholanthrene- induced rats, but the half lives differed significantly between the two induced groups. Concentrations of *S*-warfarin metabolites exceeded those of *R*-warfarin metabolites in the plasma of uninduced or induced rats. The major plasma metabolites were 4′-hydroxywarfarin from *S*-warfarin and, to a lesser extent, from *R*-warfarin. Plasma *R*- and *S*-warfarin

metabolite patterns were markedly different from *in vitro* patterns catalyzed by hepatic microsomal enzymes of uninduced and phenobarbital- or 3-methylcholanthrene-induced rats. In uninduced rats a dose of 1 mg of *S*-warfarin/kg produced an anticoagulant response equivalent to 10 mg of *R*-warfarin/kg. The intrinsic activity of *S*-warfarin was calculated to be 4.9 ± 0.4 times that of *R*-warfarin. Induction of rats with phenobarbital or 3-methylcholanthrene diminished the magnitude of the normal anticoagulant response to *R*- and *S*-warfarin. (Author abstract by permission)

81-0550. Waddell, W. J.; Marlowe, C. (Dep. Pharmacol. & Toxicol., Sch. Med., Univ. Louisville, Louisville, KY 40292) **Tissue and cellular disposition of paraquat in mice.** *Toxicol. Appl. Pharmacol.* 56(1): 127-140; 1980 (42 references).

Male C57B1/6J mice were injected iv with [methyl-^{14}C]-paraquat dichloride and frozen at 1, 3, 9 and 24 hr for whole body autoradiography or with [methyl-^{3}H]-paraquat dichloride and the lungs were removed at 3, 24 and 48 hr for cellular autoradiography. The methods do not allow thawing or exposure of the tissues to solvents; this prevents translocation or removal of radioactivity. The whole body autoradiographs revealed localization of radioactivity at all time intervals in melanin, lung, choroid plexus, and muscle, and excretory pathways, such as proximal tubules of kidney, urine, liver, gallbladder, and intestinal contents. The radioactivity in lung was much higher in certain discrete, unidentified areas at all time intervals except at 1 hr. The concentration was high in myocardium at 1 and 3 hr. Cellular resolution autoradiography revealed that the radioactivity within the lung was confined almost entirely to cells having the distribution of alveolar type II cells at the three time intervals studied. The radioactivity in these cells was easily washed away indicating that an active transport process was probably involved instead of binding to a cellular constituent. The localization suggested that choline might be antidotal to paraquat toxicity. However, there was not a significant increase in survival of mice given 100 mg/kg choline chloride simultaneously to, or following, treatment with 50 mg/kg paraquat dichloride. (Author abstract by permission)

81-0551. Goldberg, A. M. (Sch. Hyg. & Public Health, Johns Hopkins Univ., Baltimore, MD 21205) **Mechanisms of neurotoxicity as studied in tissue culture systems.** *Toxicology* 17(2): 201-208; 1980 (13 references).

Unique aspects of the nervous system that make it susceptible to attacks by toxic substances are reviewed. Pharmacology and toxicology are differentiated, and the use of toxicological data is described. The types of culture systems used in neurotoxicity studies are discussed including neuroblastoma and spinal cord systems. Potential neurotoxins considered include acrylamide, carbon monoxide, chlorinated hydrocarbons, drugs, food additives, insecticides, metals, organic solvents and social poisons. Problems encountered in neurotoxicity studies such as solubility, metabolism, non-defined systems and lack of appropriate control are discussed. Studies of mercury, glutamic and kainic acid, aluminum, DFP and paraoxon, and methyl butyl ketone have been made in tissue culture experiments. Tests with various organophosphate insecticides suggest that their action as inhibitors of cholinesterase appears to be unrelated to the mechanism causing delayed neurotoxicity.

81-0552. Goldberg, A. M.; Brookes, N.; Burt, D. R. (Sch. Hyg. & Public Health, Johns Hopkins Univ., Baltimore, MD 21205) **The use of spinal cord cell cultures in the study of neurotoxicological agents.** *Toxicology* 17(2): 233-235; 1980 (5 references).

Biological effects of organophosphate ester (DFP and paraoxon) exposure were evaluated using primary cell cultures of mouse embryo spinal cords. Amino acid exposure was also evaluated. Distal degeneration of long axons in peripheral nerves and spinal tracts was noted 8-14 days after *in vivo* exposure. This was accompanied by sensory symptoms and motor weakness. The delayed neuropathy was not related to the anticholinesterase activity of the chemicals. Protein content and cholinekinase activity were unchanged. An inductive effect of DFP, but not of paraoxon, was noted on choline acetyltransferase-containing cells *in vitro*.

81-0553. Roux, F.; Treich, I.; Fournier, E. (Unit. Rech. Toxicol. Exp., INSERMU, 26, Hop. Fernand Widal, F-75475 Paris, France) **Different levels of changes induced by the insecticide lindane in cultured C-6 glioma cells.** *Toxicology* 17(3): 261-264; 1980 (8 references).

C-6 glioma cells were cultured in Dulbecco's modified Eagle medium supplemented with 5% fetal calf serum. Lindane effects were studied on 3-day-old cultures, exposed at concentrations of 1×10^{-4} *M* lindane. Uptake of α-amino-isobutyric acid was significantly inhibited. Uridine uptake was reduced at doses of 5×10^{-5} *M* or more. Cultures were then exposed for 1-20 hr. Early changes resulting from cell interaction with lindane demonstrated that the product exerted an immediate inhibitory effect on uptake of α-aminoisobutyric acid and uridine, reflecting a change in the transport system of the non-metabolizable amino acid analog. Inhibitions induced after 1 hr exposures were immediately reversible after lindane was removed, suggesting that one primary effect is the modification of basic membrane mechanisms. After the 20 hr exposure, uridine inhibited uptake was not immediately reversed.

81-0554. Metelitsa, G. I. (All-Union Res. Inst. Vet. Entomol. & Arachnol., USSR) **Izmeneniya v organakh i tkaniakh teliat posle obrabotki khlorophosom. [Changes in organs and tissues of calves after treatment with chlorophos.]** *Veterinariya (Moscow)* (9): 59-60; 1980 (Russian).

To test the effect of chlorophos (trichlorfon) aerosol on certain histochemical structures of organs and tissues of cattle, calves were treated at rates of 1, 1.5 and 3 g/m³ (concentration of aerosol in the chamber) for 60 min. On days 1, 7 and 20 after the treatment, calves were sacrificed and specimens of internal organs and tissues were analyzed to histochemically. On day 7 after exposure, there were decreased of RNA levels in heart muscle, kidney nephrons, and in cuboidal epithelium of excretory ducts. RNA levels were increased in upper airways and in lungs. On day 20 after the treatment, RNA levels returned to normal values. Activity of cholinesterase showed decreases in all organs tested: maximum inhibition of cholinesterase activity was recorded on day 2 after treatment, but the degree of inhibition did not exceed 25% even after treatment at 3 g/m³. The use of chlorophos aerosols at the doses tested is recommended for the treatment of calves with hypodermatosis.

81-0555. Kosinova, N. R.; Kuznetsov, Yu. G. (Azov Res. Inst. Fish., Azov, USSR) **Pestitsidy i aktivnost' peroksidazy. [Pesticides and peroxidase activity.]** *Veterinariya (Moscow)* (9): 62-63; 1980 (Russian).

To evaluate the effect of various pesticides on peroxidase activity of the blood and certain organs of fish, carp yearlings were exposed to organophosphorus pesticides, organochlorine pesticides, and inorganic pesticides (copper oxychloride) at concentrations ranging from 0.1 LC50 to 0.01 LC50. It was found that all pesticides at 0.1 LC50 stimulated peroxidase activity during the first 15 days of the experiment. On day 30, peroxidase activity of the blood returned to normal values. At 0.01 LC50, Baitex and sodium trichloroacetate (sodium TCA) had no effect on blood peroxidase, while Antio (formathion) caused a slight decrease (by 5-15%) of peroxidase activity. It was found that metaphos (methyl parathion) increased activity of peroxidase in the brain and liver (by 150% and 66%, respectively, on day 15 after the treatment), but had no significant effect on peroxidase activity of the gills. It was concluded that pesticides cause nonspecific changes in the peroxidase activity, and that this parameter can be used for diagnosis of fish poisoning only in combination with other biochemical and physiological parameters.

81-0556. Evodokimov, S. M.; Akulov, A. V.; Zhavoronkov, N. I.; Verkhovskii, A. P.; Antsiferov, S. D. (All-Union Res. Inst. Exp. Vet. Sci., Moscow, USSR) **Patomorfologicheskie izmeneniya pri otravlenii proizvodnymi karbaminovoi kisloty. [Pathomorphological changes after poisoning with derivatives of carbamic acid.]** *Veterinariya (Moscow)* (9): 64-65; 1980 (Russian).

Pathomorphological changes after poisoning with five derivatives of carbamic acid [Sevin (carbaryl), triallate, zineb, TMTD (thiram) and polycarbacine] were studied in mice, chickens, rabbits, sheeps, pigs and calves. Postmortem examinations of animals after acute poisoning showed congestive hyperemia, hemorrhages, and serous edema. The changes in the parenchymatous organs were characterized by the development of dystrophy and inflammation of the gastrointestinal tract. Carbamate pesticides decreased egg production within the first 3-12 days of the poisoning.

81-0557. Gunkel, G.; Streit, B. (Limnol. Inst., Konstantz, BRD) **Mechanisms of bioaccumulation of a herbicide (atrazine, s-triazine) in a freshwater mollusc (*Ancylus fluviatilis* Mull) and a fish (*Coregonus fera* jurine).** *Water Res.* 14(11): 1573-1584; 1980 (47 references).

The bioaccumulation of atrazine in molluscs and fish was investigated. White fish *(Coregonus fera)* and the mollusc *(Ancylus fluviatilis)* were exposed to various concentrations of the labeled and unlabeled pesticide from 50 μg/l to 253 μg/l. At various intervals, samples of tissues were analyzed for concentrations by gas chromatography and for radioactivity. The kinetics of accumulation indicate that atrazine is accumulated via the gills. Other internal organs become contaminated via blood, after it has passed through the gills.

81-0558. Kapoor, K.; Sharma, V. K. (Dep. Bot., Sch. Basic Sci. Humanit., Univ. Udaipur, Udaipur 313001, India) **Effect of certain herbicides on survival, growth, and nitrogen fixation of blue-green alga *Anabaena doliolum* Bharadwaja.** *Z. Allg. Mikrobiol.* 20(7): 465-469; 1980 (9 references).

Studies were conducted to determine the effects of several herbicides on the blue-green algae *Anabaena dolium*. Various concentrations of up to 0.1% of 4 herbicides were added to growth media of cultures of *A. doliolum*. Growth (as optical density), survival, chlorophyll content, and nitrogen fixation were subsequently measured. All concentrations of all herbicides reduced cell nitrogen and chlorophyll content. Weedone (2,4-D) did not retard growth at levels below 0.09%; however, isocil, terbacil and nitrogen all inhibited growth at the 0.01% level. Growth and cellular nitrogen apparently were retarded by inhibition of photosynthesis.

See also 81-0301, 81-0304, 81-0309, 81-0311, 81-0318, 81-0326, 81-0334, 81-0335, 81-0336, 81-0337, 81-0338, 81-0347, 81-0348, 81-0349, 81-0351, 81-0352, 81-0353, 81-0354, 81-0356, 81-0359, 81-0362, 81-0364, 81-0365, 81-0366, 81-0367, 81-0368, 81-0369, 81-0370, 81-0430, 81-0443, 81-0438, 81-0451, 81-0454, 81-0457, 81-0458 *and* 81-0568.

81-0559. Thielemann, H. (Bereich Med., Univ. Halle, Halle DDR) **Vergleichende Untersuchungen ueber duennschichtchromatographische Nachweisgrenzen von DDT und seinen Metaboliten in Modelloesungen an unterschiedlichen Sorptionsschichten. [Comparative studies on the thin layer chromatographic detection limits of DDT and its metabolites in model solutions on different sorbent layers.]** *Acta Hydrochim. Hydrobiol.* 6: 567-570; 1978 (German).

The lower limits of optical and semiquantitative detectability were determined for DDT and its metabolites on 5 different sorbent layers and with 7 different spray reagents in model solutions. The sorbent layers used were Silufol UV 254, FND foils, silica gel G (Merck), silica gel D and mixed layers (50% silica gel G and 50% Silpearl). The spray reagents used were ammoniacal silver nitrate solution, rhodamine B, methyl red, methyl violet, methyl orange, silver nitrate/bromophenol blue and diphenylamine/zinc chloride. Limits of the various combinations are presented in tabular form for *o,p'*-DDT, *p,p'*-DDT, *p,p'*-DDE *o,p'*-DDE, TDE and DDMU.

81-0560. Yoshida, K.; Ishihara, K.; Ohara, S.; Azuumi, Y.; Hotta, K. * (Dep. Biochem., Sch. Med., Kitasato Univ., Sagamihara, Japan) **A simple turbidimetric method for the determination of microgram quantities of Triton X-100.** *Anal. Biochem.* 108(1): 162-165; 1980 (12 references).

Microgram quantities of the pesticide emulsifier Triton X-100 have been determined by a new method based on the formation of turbidity from Triton X-100 with phenol. In the concentration range of 20-80 μg/ml, the turbidity formed is proportional to the amount of Triton X-100 present. Turbidity formation was dependent on pH, with maximal turbidity occurring at pH 5.5-7.5. Turbidity was produced immediately on mixing with phenol and remained intact for at least 1 hr. It is suggested that lecithin concentrations in aqueous solution can also be determined by this turbidimetric method. The presence of protein, mucopolysaccharide, and nucleic acid had only small effects on the turbidity formation.

81-0561. Onuska, F. I.; Comba, M. E.; Coburn, J. A. (Natl. Water Res. Inst., Canada Cent. Inland Waters & Inland Waters Dir., Burlington, Ontario L7R 4A6, Canada) **Quantitative determination of mirex and its degradation products by high-resolution capillary gas chromatography/mass spectrometry.** *Anal. Chem.* 52(14): 2272-2275; 1980 (10 references).

A substantial part of Lake Ontario has been contaminated with mirex. Also, some specific wildlife exposures to mirex have been confirmed. The qualitative and quantitative determinations of mirex and a number of related metabolites were evaluated by mass spectrometry utilizing their electron impact (EI) ionization mass spectra. The selected ion monitoring data were compared with gas chromatographic results by use of an electron capture detector (ECD). Levels in the low picogram range were detected by using single ion monitoring at *m/z* 272 (SI-SIM), while the distinction between individual mirex metabolites was made by comparing the ratios of 4 preselected ions by use of multiple ion-selection-ion monitoring (MI-SIM). (Author abstract reprinted by permission of the American Chemical Society)

81-0562. Scholten, A. H. M. T.; de Vos, B. J.; Lawrence, J. F.; Brinkman, U. A. T. (Dep. Anal. Chem., Free Univ., NL-1081 HV Amsterdam, The Netherlands) **Catalytic hydrolysis of urea herbicides combined with column chromatography.** *Anal. Lett.* 13(A14): 1235-1247; 1980 (6 references).

The hydrolysis of urea herbicides on silica gel surfaces is described. The method involves the acidic silanol groups. A heating step is required, without any reagents, that yields complete hydrolysis in 15 min at 165°C. Derivatization of the anilines before and after gas and liquid chromatographic techniques occurs before the final analytical step. Residue analysis was performed using soil samples to demonstrate the effectiveness of the method. The method is sensitive to the low nanogram to low picogram levels.

81-0563. Ure, A. M. (Macaulay Inst. Soil Res., Aberdeen AB9 2QJ, Scotland) **Spectrochemical analysis of environmental pollutants in agricultural materials.** *Anal. Proc.* 17(10): 409-414; 1980 (16 references).

Various agricultural practices contribute to the contamination of the environment, such as the use of fertilizers, manures and pesticides. Trace elements present in these products can accumulate in the soils. Vegetable garden soils in Scotland frequently contain mercury; levels up to 10 mg mercury/kg soil are often found. This mercury arises particularly from the use of 4% calomel fungicide dusts. A comparison of the detection limits for trace metals in the environment by various spectrochemical methods, including atomic absorption, atomic emission, laser light detection and ranging, and spark source mass spectrometry, is given. Methods used in preparing the samples for the various techniques and the limitations of the techniques are also discussed.

81-0564. Mestres, R.; Atmawijaya, S.; Francois, C. (Lab. Chim. Appl. Expert., Fac. Pharm., Montpellier, France) **Methode de recherche et de dosage des residus de pesticides dans les produits cerealiers. [Method for the detection and determination of pesticide residues in cereal products.]** *Ann. Falsif. Expert. Chim.* 73(788): 407-420; 1980 (52 references) (French).

Method for the simultaneous detection and quantitative determination of carbon disulfide, methyl bromide, carbon tetrachloride, 1,2-dichloroethane (ethylene dichloride), 1,2-dibromomethane (ethylene dibromide) and ethylene chlorohydrine (ECH) in cereal products is described. The substances are extracted by sweep distillation at 150°C and collected in ice-cooled octane. ECH is detected and determined by direct solid injection technique on a gas chromatograph. The others are determined by injection of their extracts into a gas chromatograph with electron capture detector, using a column filled with Carbowax 400 on Porasil C (100-120 mesh). The recovery rate is 99-104% for the different fumigants. The minimum detectable quantity is 0.002 ng for carbon tetrachloride, 0.02 ng for methyl bromide, 0.05 ng for 1,2-dibromoethane, 0.25 ng for carbon disulfide and 2 ng for 1,2-dichloroethane. The sensitivity limit is 0.0005 mg/kg for carbon tetrachloride, 0.005 mg/kg for methyl bromide, 0.01 mg/kg for 1,2-dibromoethane, 0.06 mg/kg for carbon disulfide and 0.5 mg/kg for 1,2-dichloroethane.

81-0565. Andrews, R. E., Jr.; Iandolo, J. J.; Campbell, B. S.; Davidson, L. I.; Bulla, L. A., Jr. * (Grain Mark. Res. Lab., SEA, USDA, Manhattan, KS 66502) **Rocket immunoelectrophoresis of the entomocidal parasporal crystal of *Bacillus thuringiensis* subsp. *kurstaki*.** *Appl. Environ. Microbiol.* 40(5): 897-900; 1980 (11 references).

Rocket immunoelectrophoresis was used to quantitate the soluble parasporal crystal of *Bacillus thuringiensis* subsp. *kurstaki*. The method described is rapid, reliable, specific, and extremely accurate, and it can be used to measure crystal toxin in commercial microbial insecticides that contain a mixture of spores, vegetative cells, and carrier materials. (Author abstract by permission)

81-0566. Meedel, T. H. (Wistar Inst. Anat. & Biol., Philadelphia, PA 19104) **Purification and characterization of an ascidian larval acetylcholinesterase.** *Biochim. Biophys. Acta* 615(2): 360-369; 1980 (29 references).

Larval acetylcholinesterase (acetylcholine acetylhydrolase, AChE; EC 3.1.1.7) of the ascidian *Ciona intestinalis* (L.) was purified by a two-step affinity chromatography procedure. Concanavalin A-Sepharose chromatography in batches provided the initial purification and was followed by chromatography on columns to which competitive inhibitors of AChE had been attached. The most efficient of these was *m*-carboxyphenylmethylammonium iodide coupled to Sepharose 4B via a hydrophobic 6-carbon spacer. In combination with the concanavalin A-Sepharose step, this affinity resin yielded recoveries of 30-39% with specific activities ranging from 580-730 units/mg protein, a total purification of 5000–7000-fold. Analysis of this product by polycrylamide gel electrophoresis in the presence of SDS and β-mercaptoethanol revealed a single major polypeptide M_r 65,000-70,000. This protein was identified as the basic catalytic submit of AChE by its coelectrophoresis with [^{3}H]diisopropyl fluorophosphate-labeled enzyme. Sucrose density gradient studies demonstrated that the purified enzyme consisted of three distinct species that appeared to be qualitatively the same as those seen in crude extracts. The largest species (11 S) is possibly a tetramer of the basic catalytic subunit and the two smaller forms, the monomer and dimer. Purified enzyme was also used to produce anti-AChE antibody in rabbits. IgG prepared from sera of immunized rabbits was shown to react completely (greater than 98%) with AChE from crude larval homogenates. This result also supports the conclusions that no qualitative selection occurred during the purification procedure and that the basic catalytic subunit is a fundamental component of all the larval AChEs.

81-0567. Wedzisz, A. (Dep. Food Sci., Inst. Environ. Res. & Bioanal., Acad. Med., PL-90145 Lodz, Poland) **Zastosowanie reakcji hamowania cholinoesterazy *in vitro* do oznaczania niektorych pestycydow w badaniach dynamiki ich zanikania w uprawach roslin warzywnych. [Application of *in vitro* cholinesterase inhibition for the determination of some pesticides in the assay of decay dynamics in vegetable cultures. Part III. Study on the use of a quantitative enzymatic method for the assay of inhibitors in plant extracts.]** *Bromatol. Chem. Toksykol.* 12(2): 135-140; 1979 (5 references) (Polish).

A quantitative enzymatic method was used in fortified plant extracts and in extracts from plants treated with diazinon to determine trace amounts of inhibitors without purification. Extracts of edible parts of head cabbage, brussel sprouts, and carrots were used. This method permits the determination of quantities of inhibitor below tolerance values. It is quite simple and less time consuming than thin-layer and gas chromatography. The method is based on enzymatic reactions which can be used to verify and quantitatively determine results obtained by the thin-layer chromatography method with semi-quantitative enzymatic detection. The usefulness of this method in the determination of currency cycles for acylcholine acylhydrolase inhibitors was shown.

81-0568. Oledzka, R.; Wasilewska, H. (Dep. Food Sci., Inst. Pharm., Acad. Med., Warsaw, Poland) **Badania wplywu dichlorfosu, trichlorfonu i dinokapu na proces rozpuszczania, tworzenia sie i wzrostu krysztalow hydroksyapatytu *in vitro*. [*In vitro* studies on the effect of dichlorvos, trichlorfon, and dinocap on the process of solubilization, formation, and augmentation of hydroxyapatite crystals.]** *Bromatol. Chem. Toksykol.* 12(4): 313-317; 1979 (14 references) (Polish).

Studies were designed to determine the effects of the pesticides dichlorvos, trichlorfon, and dinocap on the

solubility and formation of hydroxyapatite crystals. In order to investigate effects on solubility in a fluid containing the test pesticide and hydroxyapatite crystals, calcium was measured by atomic absorption spectrophotometry and phosphorous was measured by colorimetry. An isotope procedure, involving scintillation counting to determine the amount of $^{45}CaCl_2$ incorporated into the hydroxyapatite crystals in the presence of pesticide, was used to study effects on augmentation and formation. The results indicate that the pesticides do not have a direct effect on the solubility or formation of hydroxyapatite crystals, but that the pesticides have a significant effect on the augmentation process.

81-0569. VanNess, G. F.; Solch, J. G.; Taylor, M. L.; Tiernan, T. O. (Brehm Lab., Wright State Univ., Dayton, OH 45435) **Tetrachlorodibenzo- *p*-dioxins in chemical wastes, aqueous effluents and soils.** *Chemosphere* 9(9): 553-563; 1980 (15 references).

Analytical methodology is described in which small aliquots of either chemical or environmental samples are prepared for instrumental analysis, using simplified procedures, to determine concentrations of tetrachlorodibenzo-*p*-dioxins (TCDDs) in chemical wastes, aqueous effluents and soils. Use of gas chromatography/mass spectrometry or high resolution gas chromatography-low resolution mass spectrometry is outlined. The identification of specific TCDD isomers is also considered, particularly 2,3,7,8-TCDD. Typical results on soil samples taken from an industrial site showed that 85% of the samples contained TCDD in concentrations ranging from < 20 pg/g to 0.6 μg/g. Residues from the chemical retorting of chlorinated phenols were easily analyzed. However, other industrial sludge samples were very complex and preparation was tedious.

81-0570. Ahuja, S. (Anal. Res. & Dev., Ciba-Geigy Corp., Suffern, NY 10901) **Ultratrace analysis.** *Chemtech* 10(11): 702-707; 1980 (34 references).

A review is presented of various ultratrace analysis methods (detection of ppt or pg level concentrations). Electron-capture detection systems in gas chromatography have detected 0.1 pg aldrin, 0.1 pg heptachlor and 0.2 pg lindane in a sample of benzene. Analysis of a tapwater sample by GC/MS found 1.3 ppt lindane, 0.7 ppt aldrin and 0.0053 ppt chlordane. It is predicted that the need for safety assurances for cosmetics, drugs, the environment and food will result in the development of analytical capabilities beyond the pg (10^{-12}) and fg (10^{-15}) levels.

81-0571. Haering, M.; Schefer, W. (Eidg. Materialpruef. & Versuchsanst., CH-9000 St. Gallen, Switzerland) **Quantitative Analyse von Biozid-Rueckstaenden. [Quantitative analysis of biocide residues.]** *Chimia* 34(9): 397-400; 1980 (6 references) (German).

The general principles of the quantitative analysis of pesticide residues are discussed. An example for the determination of pentachlorophenol (PCP), used as a wood preservative in a hay-shed, in hay and milk is given. Extraction, clean-up of the solutions, and analytical determination are the basic steps involved in residue analysis. Distribution between two immiscible solvents and column chromatography are the most commonly used clean-up methods. Gas chromatography is most important as an analytical method, followed by colorimetry, and polarography. Hay samples stored in a hay-shed for 6 mo after a 6-wk waiting period after treatment with PCP contained an average PCP residue of 200 ppb, but 850-1400 ppb were found in samples taken directly at the shed walls. The analysis was performed by gas chromatography with electron capture detection. PCP residues of 35-40 ppb were found in the milk of cows kept in the shed, and 160-450 ppb were found in the milk of cows fed contaminated hay.

81-0572. Scheidl, I.; Pfannhauser, W.; Woidlich, H. (Forschunginst. Ernaehrungswirtschaft, A-1190 Vienna, Austria) **Gaschromatographische Bestimmung von Pyrethrinrueckstaenden in Mehlproben. [Gas chromatographic determination of pyrethrins in food samples.]** *Dtsch. Lebensm. Rundsch.* 76(9): 309-311; 1980 (6 references) (German).

A method for the determination of pyrethrin residues in flour is described. Following extraction with dichloromethane, organochlorine hydrocarbons and PCBs, which would interfere with the gas-chromatographic determination, are separated by clean-up on a Florisil column. Two other fractions, which contain pyrethrin I and II, respectively, are collected with a diethyl ether/petroleum ether as eluents. These fractions are separated by gas chromatography and detected by means of an electron capture detector. The recovery rate is 91-106% at 1 ppm. The detection limit is 0.01 ppm. The maximum allowable pyrethrin residues in Austria are 3 ppm for grain, 1 ppm for fruit and vegetables other than root vegetables, and 0.05 ppm for other food products.

81-0573. Kuhlmann, F. (Chem. Anal. Inst. Kuhlmann, D-6700 Ludwigshafen, BRD) **Rueckstandsbestimmung von Carbendazim mittels Hochdruckfluessigkeitchromatographie. [Determining carbendazim residues by HPLC.]** *Dtsch. Lebensm. Rundsch.* 76(10): 351-353; 1980 (5 references) (German).

An analytical method for determining carbendazim residues in cereal grains, stalks or entire plants by high-pressure liquid chromatography is presented. The pesticide is extracted with HCl:CH_3OH; the extract is purified by clean-up chromatography with chloroform and acetic acid ethylester. Quantitative determination by

reversed phase C18 is accomplished by UV photometry. The result can be checked on a cation-exchange column. The carbendazim decomposition product 2-aminobenzimidazol exhibits a different retention time and can be determined simultaneously with this method. The detection threshold is 0.05 ppm; the recovery ratio is 80%.

81-0574. Weiss, A. H.; LaPierre, R. B. (Worcester Polytech. Inst., Worcester, MA) **Gas chromatographic/mass spectrometric analysis of partially dechlorinated 1,1-diphenyl ethane and ethylene.** *Environ. Int.* 3(4): 353-357; 1980 (8 references).

Previously unreported mass spectra of partially dechlorinated DDT and DDE homologs are presented along with a relatively complete set of relative retention time data for the homologous series of compounds between DDT and DDE and their corresponding hydrocarbons. Fragmentation across the aliphatic C−C bond characterizes the mass spectra of all partially dechlorinated ethane intermediates. Rupture of the C−Cl bond characterizes the mass spectra of the corresponding olefins. The use of gas chromatography/mass spectrometry techniques has allowed the establishment of the procedure capable of identifying partially dechlorinated homologs of DDT and DDE. The same approach may be useful in identifying other partially dechlorinated pesticides.

81-0575. Tsuji, S.; Tobin-Gros, C. (Lab. Cytol., Univ. Paris VI, F-75005 Paris, France) **A simple silver nitrate impregnation of nerve fibers with preservation of acetylcholinesterase activity in the motor endplate.** *Experientia* 36(11): 1317-1319; 1980 (12 references).

A technique is described for silver nitrate impregnation of nerve fibers while preserving enzymatic activity. The ten steps for the silver nitrate impregnation technique are described. The important factors to consider are use of a buffered formaldehyde fixative, a not too strong enzyme-inhibitory lipid-releasing solvent or detergent, a mild pH at room temperature with a short impregnation time, and diluted reducing agents. When this impregnation is followed by α-naphthol cholinesterase histochemistry, it is seen that, if acetylcholine is inactivated by silver nitrate, this inhibition must be reversible.

81-0576. Caccialanza, G.; Gandini, C.; Roggi, C.; Zecca, E. (Dip. Chim. Farm., Univ. Studi Pavia, Pavia, Italy) **Determinazione diretta di 2-imidazolidintione (ETU) in matrici alimentari mediante cromatografia liquida ad alta pressione (HPLC). [Direct determination of 2-imidazolidine thione (ETU) in food by high-pressure liquid chromatography (HPLC).]** *Farmaco. Ed. Prat.* 35(9): 449-454; 1980 (20 references) (Italian).

Method for the quantitative determination of 2-imidazolidine thione (ethylenethiourea, ETU) in foods and specifically in fruits is described. Following homogenization and extraction with methanol and clean-up of the extract on an alumina-filled column, ETU is determined by inverse-phase high-pressure liquid chromatography, using methanol-water (10:90 v/v) as a mobile phase. The determination is done at 240 nm. The retention time is 4.5 min. The response is linear in the range of 500 pg to 10 μg. The recovery rate is 92-97%.

81-0577. Vasilenko, V. E. (I. M. Sechenov Med. Inst. I, Moscow, USSR) **Opredelenie khlorokholinkhlorida v ob'ektakh vneshnei sredy metodom tonkosloinoi khromatografii. [Use of thin layer chromatography for determination of chlorocholinechloride in environmental objects.]** *Gig. Sanit.* 45(10): 54-56; 1980 (9 references) (Russian).

Thin layer chromatography was used for determination of the growth regulating agent chlorocholinechloride (CCC; chlormequat chloride) in the environment. The mobile phase consisted of glacial acetic acid, acetone, methanol, and water (5 + 5 + 20 + 70). Silufol was used as a sorbent. Sensitivity of the method was 0.025 mg/sample. The method allowed identification of both CCC and its metabolites cholinechloride and trimethylamine hydrochloride (the R_f values were 0.13, 0.45 and 0.61, respectively).

81-0578. Heikes, D. L. (Total Diet Res. Cent., US FDA, Kansas City, MO 64106) **Mass spectral identification and gas-liquid chromatographic determination of methyl 4-chloroindolyl- 3-acetate in canned and frozen peas.** *J. Assoc. Off. Anal. Chem.* 63(6): 1224-1225; 1980 (8 references).

Methyl 4-chloroindolyl- 3-acetate (MCIA), a naturally occurring auxin, has been identified in canned and frozen peas by gas-liquid chromatography (GLC)/mass spectrometry. Eight samples were analyzed for MCIA using slightly modified official AOAC multiple pesticide residue procedures employing GLC with microcoulometric detection. Levels of MCIA averaged 0.20 ppm for canned peas and 0.16 ppm for frozen peas. Recovery of MCIA from a fortified sample was 40%. It is suggested that MCIA presents a potential for interfering with the determination of pesticide levels by AOAC multiple pesticide residue procedures.

81-0579. Carlstrom, A. A. (Chevron Chem. Co., Richmond, CA 94804) **High pressure liquid chromatography of captan in formulations: collaborative study.** *J. Assoc. Off. Anal. Chem.* 63(6): 1231-1237; 1980 (4 references).

A simple method for measuring captan was tested by 18 collaborators. Formulations are extracted with

methylene chloride which contains diethyl phthalate as an internal standard, and detected at 254 nm after high pressure liquid chromatographic separation in a 25 cm × 4 mm column packed with 10 μm silica gel. After inert materials are removed, the supernate is added directly to the column with methylene chloride as the mobile phase; peak height ratios are used for quantitation. Most pesticides commonly formulated with captan do not interfere. Retention times and UV response factors relative to captan are listed for 34 pesticides formulated with captan. The collaborators made single determinations on 6 samples (3 pairs of duplicates). The coefficients of variation were 0.67% for the technical, 1.16% for the 50% wettable powder, and 1.71% for the 5% dust. Several collaborators were unable to separate carbaryl and dimethyl phthalate on a combination dust containing captan, dicofol and carbaryl; therefore, the method has been adopted as official first action only for captan formulations containing no other active ingredients. (Author abstract by permission)

81-0580. Kuehl, D. W.; Leonard, E. N.; Welch, K. J.; Veith, G. D. (Environ. Res. Lab., US EPA, Duluth, MN 55804) **Identification of hazardous organic chemicals in fish from the Ashtabula River, Ohio, and Wabash River, Indiana.** *J. Assoc. Off. Anal. Chem.* 63(6): 1238-1244; 1980 (10 references).

Composite fish samples from the Wabash River, IN, and the Ashtabula River, OH, were analyzed by conventional pesticide procedures for PCBs, DDTs, chlordane components, and hexachlorobenzene. Additional aliquots of each sample were processed by gel permeation chromatography and were analyzed with gas chromatography-mass spectrometry by using both electron impact and negative chemical ionization modes. These analyses resulted in the identification of a series of chlorinated alkanes, chlorinated alkenes, chlorinated alkylamines containing 2-5 carbons, and polychlorinated styrenes in the Ashtabula River Sample, and a series of chlorinated norbornenes, pentachlorobenzyl alcohol, and pentachlorophenol in the Wabash River sample. (Author abstract by permission)

81-0581. Wheeler, W. B.; Thompson, N. P.; Andrade, P.; Krause, R. T. (IFAS Pestic. Res. Lab., Univ. Florida, Gainesville, FL 32611) **Extraction efficiencies for pesticides in crops: ^{14}C-benomyl extraction from mustard greens and radishes.** *J. Assoc. Off. Anal. Chem.* 63(6): 1286-1290; 1980 (9 references).

^{14}C-labeled benomyl [methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate] suspended in a commercial benomyl formulation was sprayed on mustard greens and radishes. At 3 intervals after application, the crops were extracted with methanol, acetonitrile, or acetone. Crops were either blended and leached or repetitively blended followed by Soxhlet extraction. Essentially all of the extractable radioactivity was removed by blending. The ^{14}C was more difficult to extract from radishes than from mustard greens as time increased. Respective percentages of ^{14}C extracted at 1, 7 and 14 days were 99, 98 and 97 from mustard greens and 96, 88 and 79 from radishes. Methanol exhibited the highest extraction efficiency, and the blend-Soxhlet process was better than the blend-leach process. Thin layer chromatography of the organic-soluble extracts indicated that the majority of ^{14}C was recovered as methyl 2-benzimidazole carbamate (MBC; carbendazim), a breakdown product of benomyl. Acid hydrolysis of the extracted tissues released 30-50% of the residual ^{14}C. (Author abstract by permission)

81-0582. Chiba, M.; Veres, D. F. (Res. Stn., Agric. Canada, Vineland Station, Ontario LOR 2EO, Canada) **High performance liquid chromatographic method for simultaneous determination of residual benomyl and methyl 2-benzimidazole carbamate on apple foliage without cleanup.** *J. Assoc. Off. Anal. Chem.* 63(6): 1291-1295; 1980 (7 references).

A simple HPLC method has been developed to individually determine residues of benomyl and MBC (carbendazim) on apple leaves without cleanup. Sample leaves in a Mason jar are freeze-dried and tumbled for extraction in $CHCl_3$ containing 5000 μg *n*-propyl isocyanate/ml at 1°C. *n*-Butyl isocyanate is added to the extract at 5000 μg/ml, and 20 μl of the mixture is injected into the HPLC system. A Brownlee LiChrosorb silica gel column with a guard column is operated with a mixed mobile phase of chloroform-hexane (4 + 1) saturated with water. MBC, present as a degradation compound of benomyl, is identified as methyl 1-(*n*-propylcarbomoyl)-2-benzimidazole carbamate (MBC-*n*-PIC derivative). At 280 nm, both benomyl and MBC-*n*-PIC can be detected with a UV detector at a level of 0.2 ppm in apple leaves. (Author abstract by permission)

81-0583. Rothman, A. M. (Rohm & Haas Res. Lab., Spring House, PA 19477) **High performance liquid chromatographic analysis of dicofol acaricide.** *J. Assoc. Off. Anal. Chem.* 63(6): 1296-1299; 1980 (8 references).

Kelthane Technical, a dicofol acaricide marketed by Rohm and Haas Co., and 18 impurity components can be resolved by a new reverse phase high performance liquid chromatographic (HPLC) method using a methanol-water-acetic acid (75 + 25 + 0.2) mobile phase, a high resolution C_8 column in series with a short C_{18} guard column, and detection at 254 nm. Relative elution volumes and relative sensitivities for all known Kelthane Technical components are reported. This HPLC method has few co-elution problems, can be performed on a basic HPLC system, avoids the thermal degradation of Kelthane experienced in the previously established gas-liquid chromatographic (GLC) procedures, and can detect all impurity components to at least 0.1% level. (Author abstract by permission)

81-0584. Lawrence, J. F.; Panopio, L. G. (Health Prot. Branch, Food Res. Div., Health & Welfare Canada, Tunney's Pasture, Ottawa, Ontario K1A OL2, Canada) **Comparison of gas and liquid chromatography for determination of anilazine in potatoes and tomatoes.** *J. Assoc. Off. Anal. Chem.* 63(6): 1300-1303; 1980 (9 references).

Anilazine [2,4-dichloro-6-(2-chloroanilino)-1,3,5-triazine], a triazine fungicide, is extracted from potatoes or tomatoes with acetonitrile. An aliquot of the filtered extract is partitioned between methylene chloride and water. The organic phase is concentrated and passed through a 3% deactivated florisil column for cleanup. The eluted anilazine is then concentrated and determined by liquid chromatography (LC) on LiChrosorb RP-8 column with a mobile phase of acetonitrile-water (55 + 45) and detection at 275 nm, the absorption maximum of anilazine. Twenty-five nanograms produces a 5 cm peak under the conditions used. Detection limit is about 0.02 ppm in both vegetables. A comparison is made with gas chromatography, using either an electron capture (EC) or nitrogen-phosphorus alkali-flame ionization (NP) detector. Separations are carried out on a 4% SE-30 + 6% SP-2401 column at 195°C at 40 ml/min. Detection limits for all systems studied are about 0.02-0.05 ppm in the samples studied. Recoveries over a concentration range of 0.2-10.0 ppm are greater than 80% with the extraction procedure employed and LC determination. (Author abstract by permission)

81-0585. West, S. D.; Burger, R. O. (Agric. Anal. Chem., Lilly Res. Lab., Eli Lilly & Co., Greenfield, IN 46140) **Gas chromatographic determination of fluridone aquatic herbicide and its major metabolite in fish.** *J. Assoc. Off. Anal. Chem.* 63(6): 1304-1309; 1980 (8 references).

A gas liquid chromatographic (GLC) method is described for determining residues of the aquatic herbicide fluridone {1-methyl-3-phenyl-5-[3-(trifluoromethyl) phenyl]-4(1*H*)-pyridinone} and its major metabolite (1-methyl-3-(4-hydroxyphenyl)-5-[3-(trifluoromethyl) phenyl] 4-(1*H*)-pyridinone fish. Both compounds are extracted from fish tissue with methanol, and the extracts are subjected to acidic hydrolysis to release conjugated forms of fluridone and the metabolite. After purification by liquid-liquid partitioning, sample extracts are reacted with methyl iodide to methylate the metabolite, and then both fluridone and the metabolite are brominated with phosphorus tribromide. After purification by florisil column chromatography, the derivatives are separated and measured by electron capture GLC. The method is capable of determining approximately 0.01 ppm of both compounds in fish, and recoveries have averaged 84 ± 14.7% for fluridone and 83 ± 13.4% for the metabolite. (Author abstract by permission)

81-0586. Horwitz, W.; Kamps, L. R.; Boyer, K. W. (Bur. Foods, US FDA, Washington, DC 20204) **Quality assurance in the analysis of foods for trace constituents.** *J. Assoc. Off. Anal. Chem.* 63(6): 1344-1354; 1980 (16 references).

An examination of the results of over 50 interlaboratory collaborative studies conducted by the AOAC on various commodities for numerous analytes shows a relationship between the mean coefficient of variation (CV), expressed as powers of 2, with the mean concentration measured, expressed as powers of 10, independent of the determinative method. Some typical CV values are: drug formulations at a 1% concentration, 2%; sulfonamides in feeds at a 0.01% concentration, 4%; pesticide residues and toxic elements, 10^{-6} (1 ppm), 16%; and aflatoxins 10^{-8} (10 ppb), 32%. Analytical work at trace levels must be constantly monitored through analysis of reference materials and surrogate samples, and by independent replication. (Author abstract by permission)

81-0587. McDougall, K. W. (Board Tick Control, Dep. Agric., Lismore, New South Wales 2480, Australia) **Quickfit florisil pesticide trap for use with assisted distillation technique.** *J. Assoc. Off. Anal. Chem.* 63(6): 1355-1356; 1980 (3 references).

A quickfit florisil pesticide trap is described for use with the assisted distillation technique for the cleanup of pesticide residues in fats. Recoveries of 80-100% were obtained for 9 pesticides (hexachlorobenzene, lindane, *p,p'*-DDE, dieldrin, *p,p'*-TDE, *p,p'*-DDT, chlorpyrifos, bromophos-ethyl and ethion). No cooling is needed and there is no measurable carryover of fat from this florisil trap. (Author abstract by permission)

81-0588. Gross, D.; Gutekunst, H.; Blaser, A.; Hamboeck, H. (Agric. Div., Ciba-Geigy Ltd., CH-4002 Basel, Switzerland) **Peak identification in capillary gas chromatography by simultaneous flame ionization detection and ^{14}C-detection.** *J. Chromatogr.* 198(4): 389-396; 1980 (12 references).

The simultaneous peak identification by radiocarbon and flame ionization detection in the effluents from capillary gas chromatography is reported. A constant portion of the effluent is split off, the organic matter converted into CO_2 and the $^{14}CO_2$ monitored using an anthracene flow cell. Adsorption and condensation in the detection system (memory effects) are thereby avoided and identical conditions can be used for a variety of compounds. The system proved to be suitable for the analysis of pesticide metabolites with a specific activity down to 37 kBq/mg, the limit of detection being 7 Bq. (Author abstract by permission)

81-0589. Brinkman, U. A.; DeVries, G.; Cuperus, R. (Dep. Anal. Chem., Free Univ., NL-1081 HV Amsterdam, The Netherlands) **Stationary phases for high-performance**

thin-layer chromatography. *J. Chromatogr.* 198(4): 421-428; 1980 (13 references).

The characteristics of commercially available high-performance thin-layer chromatographic quality thin-layer plates pre-coated with silica gel, cellulose, chemically bonded phases or polyamide are discussed and compared with those of pre-coated layers used in conventional thin-layer chromatography. TLC was carried out on 2 herbicide derivatives, 4-chloroaniline and 3,4-dichloroaniline. (Author abstract by permission)

81-0590. Bidlingmeyer, B. A. (Waters Assoc., Milford, MA 01757) **Separation of ionic compounds by reversed-phase liquid chromatography: an update of ion-pairing techniques.** *J. Chromatogr. Sci.* 18(10): 525-539; 1980 (113 references).

The separation of ionic compounds using reversed-phase liquid chromatography is discussed. Although reversed-phase chromatography is most useful for separating nonpolar, nonionic compounds, reverse-phase columns can be made to retain ionic compounds by the use of pH control (ion suppression) and/or by the addition of modifiers (ion pairing). Both techniques are discussed with emphasis on practical applications. Details on the mechanisms of action are also given. A discussion is presented of the effects of mobile phase and chain length, mixing of ion-pair reagents, concentration of modifier, organic component of the eluant, and effect of charge at the ion-pair reagent. Chromatograms are presented showing separation of antihistamines and decongestants and of anesthetics. Compounds which can be successfully analyzed by this technique are listed, including the herbicide paraquat.

81-0591. Majors, R. E. (Varian Instrum. Group, Walnut Creek, CA 94598) **Multidimensional high performance liquid chromatography.** *J. Chromatogr. Sci.* 18(10): 571-579; 1980 (49 references).

A new type of chromatography is described which is especially useful for high resolution in complex samples. The technique utilizes the concept of transferring the fractions from one chromatographic column to one or more chromatographic columns for further separation. When used on-line, this technique offers convenience, automation, and a high degree of quantitation. When samples need to be concentrated prior to injection, the method can be used off-line. Malathion on tomato plants was analyzed by using liquid chromatography as the primary and secondary separation methods. Atrazine levels in sorghum were determined using liquid chromatography followed by gas chromatography (GC). Use of this system for analyzing other materials with HPLC followed by HPLC or GC is also described.

81-0592. Wauchope, R. D.; Yamamoto, M. (South. Weed Sci. Lab., Stoneville, MS 38776) **Extraction, speciation and analysis of arsenic and arsenical herbicides in runoff: evaluation of simple methods at the ppb level.** *J. Environ. Qual.* 9(4): 597-601; 1980 (12 references).

The use of column chromatographic technique for separation of inorganic arsenic (As) from methyl- and dimethyl-derivatives, and a flameless atomic absorption technique for quantitating the separated As species at the ppb level, have been evaluated for use in studies of the behavior of arsenate and methane arsonate ($CH_3AsO_3^{2-}$) ions in runoff (water and suspended sediment). The former ion is a natural component of soils. The latter ion is extensively used as an herbicide in the sodium salt and disodium salt forms, commonly called MSMA and DSMA (daminozide), respectively. Runoff from the two watersheds was spiked with 200 ppb As as arsenate or 189 ppb As as methane arsonate, or both. The partitioning of the As between sediment and water phases was measured and the As species in both phases were identified and quantitated. Recoveries ranged from 80 to 100%, and relative precision between samples averaged 10% for As concentrations between 10 and 200 ppb. In the partitioning of the added As between sediment and water phases of the runoff, arsenate appears to be much more strongly adsorbed by sediments than in methane arsonate. Although both speciation and quantitation techniques are relatively simple, they will be adequate for exploratory studies on arsenate and methane arsonate behavior in runoff and impoundments. (Author abstract by permission)

81-0593. Mann, J. B.; Freal, J. J.; Enos, H. F.; Danauskas, J. X. (Chem. Epidemiol. Div., Dep. Epidemiol. & Public Health, Sch. Med., Univ. Miami, Miami, FL 33101) **Evaluation of methodology for determining 1,2-dibromoethane (EDB) in ambient air.** *J. Environ. Sci. Health B* 15(5): 507-518; 1980 (4 references).

A method for the determination of ethylene dibromide (EDB) concentrations in air is described. A 10 cm length of 10 mm (inside diameter) glass tubing with chromosorb 101 or charcoal filter held in place by glass wool was used to sample air. Samples were extracted, then analyzed by gas chromatography. Charcoal was the most efficient, with recoveries of 103.9% (average 98%) being obtained. The influence of biphenyl content in the solvents, trapping, and elution efficiency are discussed. The proposed standard of 1 mg/m³ for a 15 min exposure is well above the sensitivity of this method.

81-0594. Mann, J. B.; Freal, J. J.; Enos, H. F.; Danauskas, J. X. (Dep. Epidemiol. & Public Health, Sch. Med., Univ. Miami, Miami, FL 33101) **Development and application of methodology for determining 1,2-dibromo-3-chloropropane (DBCP) in ambient air.** *J. Environ. Sci. Health B* 15(5): 519-528; 1980 (1 reference).

A method for determining the DBCP residue content in air is described. Experimental 0.5 acre plots (0.2025

ha) were sprayed at a rate of 96 lb AI/acre (108.48 kg/ha) with spray nozzles 18 in (45.72 cm) above ground level. Wind direction and velocity were recorded during application. Air samples were collected before, during, and after application; Chromosorb 101 was used as the trapping medium and samples were analyzed by electron capture gas chromatography. DBCP levels obtained from known samples indicated a 90% recovery with this method. In the field studies, DBCP levels of up to 322 ppb were obtained immediately after spraying. Since the experimental method was designed to simulate the potential exposure levels of the suburban population, it is recommended that spraying by the drench method not be used on residential lawns. In agricultural situations, re-entry should be delayed for one day unless safety equipment is worn.

81-0595. Saner, W. A.; Gilbert, J. (Res. & Dev. Cent., US Coast Guard, Groton, CN 06340) **A comparison of sample preparation techniques for the determination of an organo-phosphorus pesticide from water using reverse-phase HPLC.** *J. Liquid Chromatogr.* 3(11): 1753-1765; 1980 (4 references).

The pesticide Dursban (chlorpyrifos) was determined quantitatively using a methylene chloride liquid/liquid extraction and Sep-Pak C18 cartridge adsorption technique. Environmental water samples were used to determine the concentration of the pesticide in the water. These two techniques gave analytical results which were decidedly different, primarily due to the presence of a large adsorbed fraction of the pesticide. Use of both a Sep-Pak cartridge for adsorption after a preliminary filtering step using a sample clarification kit allowed both adsorbed and non-adsorbed fractions of the pesticide to be determined with effectively complete recovery.

81-0596. Fuchsbichler, G.; Ranfft, K. (Hauptversuchsanst. Landwirtsch., D-8050 Freising 12, BRD) **Die Verwendung von geschalteten Saeulen zum Nachweis von Chlorkohlenwasserstoffen. [The use of switched columns for identification of chlorinated hydrocarbons.]** *Landwirtsch. Forsch.* 32(2-3): 207-212; 1980 (8 references) (German).

The use of a venting system in double column gas chromatography with glass capillaries for identification of chlorinated hydrocarbons is demonstrated with HCB (hexachlorobenzene) and the 4 HCH (BHC) isomers. A cooled pre-column and a main column filled with 1.5% OV 17 and 2% OV 210 on GasChrom are used with various techniques such as cutting, back flush, trapping and enrichment facilitating identification. In the procedure, solvents and other volatile components are vented into the atmosphere while the substances to be identified are retained in the capillary column. Separation of the sample components occurs in the first few cm of the 20 cm long pre-column as a result of the action of the constant flow of make-up gas through the system during the venting phase. A special attachment with a cooling mantle filled with liquid CO_2 prevents the escape of the substances to be identified during venting. The recovery rate of the method is between 80 and 90%.

81-0597. Kohn, G. K. (Zoecon Corp., Palo Alto, CA 94306) **Bioassay as a monitoring tool.** *Residue Rev.* 76: 99-129; 1980 (125 references).

This review has examined various procedures and the constraints, limitations, advantages, and disadvantages of the bioassay. Examples were chosen of useful assays from both the older and the most modern procedures. The criteria for the practical extension of bioassays are enumerated. The principles for these have been emphasized and discussed in varying degree in the body of this paper. Finally, this review has selectively explored certain bioassay and monitoring procedures for insecticides, including insect growth regulators, fungicides and bactericides, and herbicides and plant growth regulators. Organisms employed are as varied as bacteria, fungi, algae, many varieties of insects and mites, many kinds of plants in various stages of their development, certain fish, and crustaceans with brief reference both to other types of agents and other species. The methodologies embrace substrates as diverse as soil, industrial wastes, animal wastes, living tissue from plant or from animals, air, and water. Both research objectives and monitoring needs will require increasing future use of bioassays. (Author abstract by permission, abridged) [Presented at the joint US-Taiwan Seminar, 1979.]

81-0598. Malinin, O. A. (All-Union Res. Inst. Exp. Vet. Sci., Moscow, USSR) **Opredelenie fosfororganicheskikh pestitsidov. [Determination of organophosphorus pesticides.]** *Veterinariya (Moscow)* (1): 72-74; 1979 (Russian).

A method of determination of a number of organophosphorus pesticides was developed. The technic is based on chromatographic separation in aluminum oxide modified by phosphoric acid. An extract of rabbit kidney was used as the enzyme source. The enzymatic method of determination in combination with thin layer chromatography on aluminum oxide increased the sensitivity of the determinations. A 50-fold increase increase was observed for DDVP (dichlorvos) and ~ 5-fold increases for Trolen (ronnel) TCM-3 (trichlormetaphos- 3) and methylnitrophos (fenitrothion).

81-0599. Schumann, G. (Bez. Hyg. Insp. & Inst., DDR-3010 Magdeburg, DDR) **Erfahrungen auf dem Gebiet der**

gaschromatographischen Herbizid-Rueckstandsanlytik am Beispiel von Phenmedipham und Fenuron. [Experience in the field of gas chromatographic herbicide residue analysis illustrated by using phenmedipham and fenuron as examples.] *Z. Gesamte Hyg. Ihre Grenzegeb.* 25(12): 926-928; 1980 (7 references) (German).

Methods for the determination of phenmedipham and fenuron residues in plants are described. The m-toluidine obtained from phenmedipham after alkaline hydrolysis, steam distillation, and extraction in a Bleidner apparatus is converted into 2,4,6-tribromo- 3-methylaniline, which can be easily determined by gas chromatography. The recovery rate is about 80% in the concentration range of 0.001-0.1 ppm. The aniline obtained from fenuron by alkaline hydrolysis is subjected to steam distillation and is extracted from the distillate with a low-boiling aliphatic hydrocarbon (n-hexane). After reextraction with 1 *M* hydrochloric acid the aromatic amine is diazotized and the diazonium radical is substituted by iodine in Sandmeyer's reaction. The iodinated derivative is extracted from the aqueous solution with n-hexane and is determined by gas chromatography as iodobenzene. The detection limit is 0.01 ppm fenuron, and the recovery rate is at least 80% in the concentration range of 0.01-0.5 ppm.

81-0600. Dolmanova, I. F.; Ugarova, N. N. (M. V. Lomonosov Moscow State Univ., Moscow, USSR) **Fermentativnye metody analiza. [Enzymatic methods of analysis.]** *Zh. Anal. Khim.* 35(8): 1597-1639; 1980 (198 references) (Russian).

The efficacy of various enzymatic assays currently used in analytical chemistry is reviewed. Enzymatic methods are used widely for the control of environmental pollution and determination of pesticides and other toxic compounds. Determination of toxic compounds is based upon their ability to inhibit such enzymes as papain, cholinesterase, peroxidase and luciferase. The soluble enzymes papain and acetylcholinesterase are used for determination of insecticides and fungicides in fruits, berries and leaves. Enzymatic methods are 10 fold more sensitive than corresponding chromatographic techniques. The limits of detectability of pesticides are significantly lower than the maximum permissible concentrations.

See also 81-0306, 81-0323, 81-0328, 81-0346, 81-0360, 81-0361, 81-0389, 81-0422, 81-0423 *and* 81-0436.

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